P.

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Animal Heat concluded —

Excretion —

by physiologists to be most probable is, that our animal heat is produced by *slow combustion;* that is, the union of oxygen with the carbon, hydrogen, nitrogen, sulphur and other elements of the blood and tissues, giving out heat less rapidly, but in the same quantity, as when wood, coal, oil or other fuel is burned in the air. Liebig has asserted, on calculation, that the amount of carbon and hydrogen shown to unite with oxygen in the body is sufficient to account for all its animal heat. Warm-blooded animals always breathe a great deal of air (birds, for example), and consume a great deal of carbonaceous food. Whether materials of food are ever "burned off" from the blood in the generation of heat, without entering first into the tissues, is not certain; probably it is so. In cold climates, Arctic explorers have found the demand for fatty (carbohydrogenous) food to be very much greater than in warm or temperate regions.

It must be understood, however, that the "combustion" of materials in the body is not, like that of wood or coal, a simple process of direct conversion of carbon, by oxidation, into carbonic acid, and of hydrogen into water. Step by step combinations are formed, of which the *last results*, only, are these familiar substances.

Prof. Dalton regards animal heat as the result of a chemical, but not strictly of a combustive process. His language is, in part, as follows:[1] "The numerous combinations and decompositions which follow each other incessantly during the nutritive process, result in the production of an internal or vital heat, which is present in both animals and vegetables, and which varies in amount in different species, in the same individual at different times, and even in different parts and organs of the same body."

The *nervous* system has a considerable though unexplained influence over animal heat. This is shown by the coldness following great shocks to the nervous centres, the loss of temperature in paralyzed limbs, and the occasional increase of temperature under nervous excitement.

The power of resisting the depressing action of exposure to cold is greatest in adolescence; least in infancy and old age. Clothing, by its non-conducting property, *retains* heat, that is, prevents or retards its loss; but it does not *make* us warm, in a positive sense.

[1] Treatise on Physiology, 4th edition, p. 247.

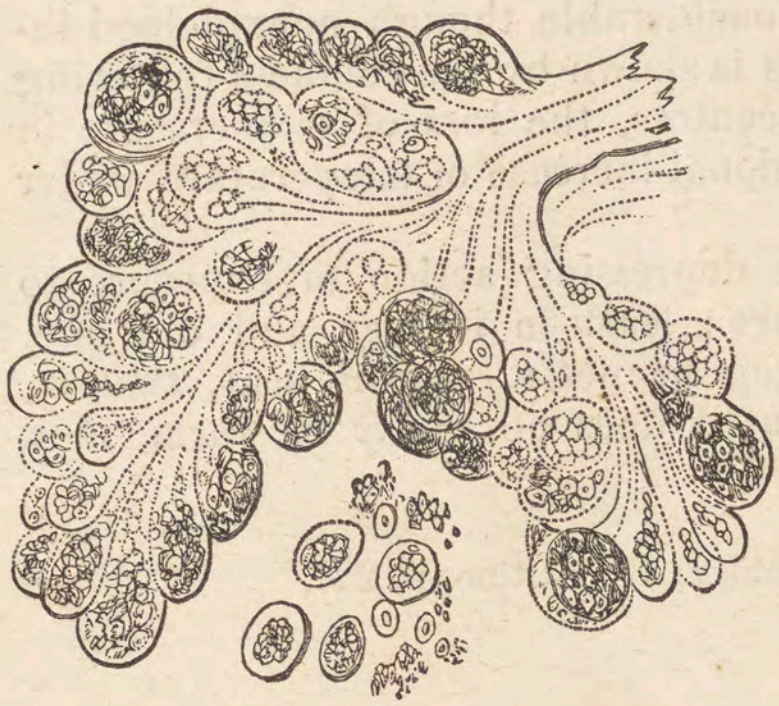
CHAPTER IV.

EXCRETION.

BESIDES carbonic acid, which must be thrown out from the blood, other substances, results of chemical changes in the different parts of the living body, have to be removed from it. No particle seems to remain *permanently* in the form and condition into which it is organized; but each passes from the organic to the *effete* or post-organic state; when, if retained, it will be obstructive and injurious to the system. Poisonous and even fatal effects may result from the retention in the blood of excrementitious matter; as, in *uræmia*, when the action of the kidneys is suppressed; *cholæmia*, when the liver fails to secrete bile, etc. *Toxæmia* is blood-poisoning from any cause. This is prevented very often, even when deleterious agents have been taken into the blood, by the emunctories or excretory organs eliminating it.

Excretion is always a secretory process; but secretion is not always excretion. The former term is applicable whenever anything is, by glandular or follicular action (*i. e.*, by the selective power of cells), separated from the blood. The latter, excretion, occurs only when the material removed is altogether *waste*, and cannot be used for any purpose connected with the organism. Milk, for instance, is a secretion, but not an excretion; because it is available, and is produced, for the nourishment of offspring. Urine and feces are entirely excretory. Bile is only partly so.

Fig. 127.



BRUNNER'S GLAND, MAGNIFIED.

Secretion and excretion being, however, so nearly alike in nature, we may, without impropriety, enumerate together their most definite products, as follows:—

Dr. J. E. Hunt ascertained (Proc. Acad. Nat. Sci, 1874) that in 3 species of *Nepenthes* excretory gland-ducts exist; not observed before in other plants, — though glands and excretions have been in some of them.

Toxæmia —
asphyxia — (Carbonæmia)
Uræmia
Cholæmia
Septicæmia
Pyæmia

Pyrexiæmia (Fever
Typhus
Typhoid

Specific Toxæmia
Variola
Scarlatina
Morbilli
Malarial Fever
&c —

Liver

Spleen

8.

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Secretion of Bile

What is excretion?

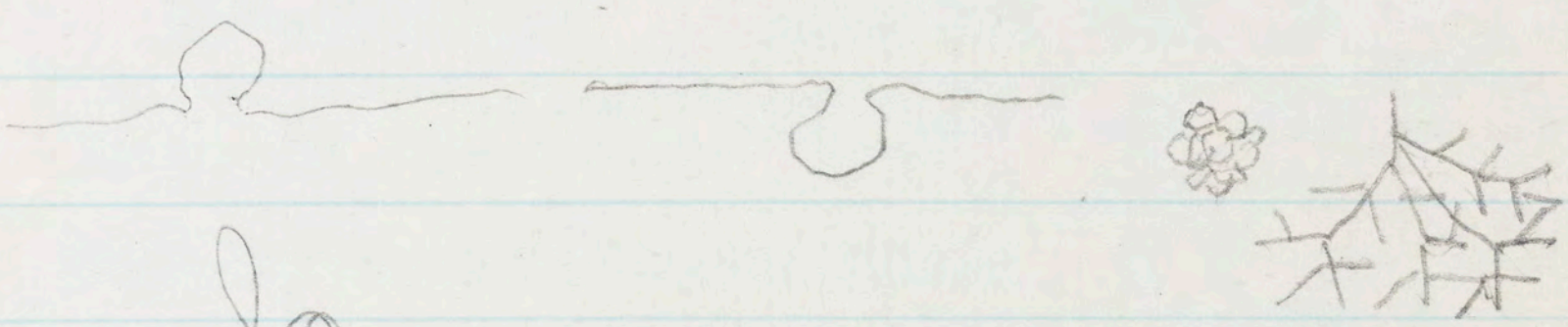
Is all secretion excretion?

What is toxæmia? Uræmia? Cholæmia?

Is excretion essential to life?

What organs are, in man, exclusively excretory?

Glands - plans:



Ptyalin,	Cholesterin,
Pepsin,	Taurocholic Acid,
Pancreatin,	Glycocholic Acid,
Creatin,	Glycogen,
Creatinin,	Excretin,
Lactic Acid,	Stercorin,
Lactin,	Urea,
Butyrin,	Uric Acid.

Pigments, as biliary coloring matter (biliverdin, biliphein, or cholepyrrhin) and coloring matter of the urine (urosacin, uroxanthin).

Also, excretory *salts;* as urates, phosphates, sulphates, &c., dissolved in water.

The most important excrementitious substances of the body are thus stated by Dalton:—

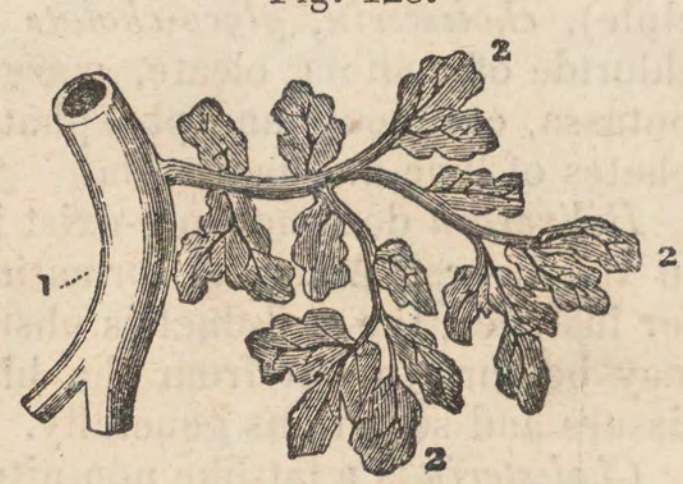
1. Carbonic Acid	CO_2.
2. Urea	$C_2H_4N_2O_2$.
3. Creatin	$C_8H_9N_3O_4$.
4. Creatinin	$C_8H_7N_3O_2$.
5. Urate of Soda	$NaO,C_5HN_2O_2+HO$.
6. Urate of Potassa	$KO,C_5HN_2O_2$.
7. Urate of Ammonia	$NH_4O,2C_5HN_2O_2+HO$.

The organs which are altogether excretory, in the human economy, are, the kidneys and the large intestine. Partly so, are the lungs, liver, and skin. Having considered already the functional action of the lungs, we may now briefly attend to that of the liver, kidneys, bowels, and skin.

Secretion of Bile.

Only the liver, of all the glands of the human body, is supplied with venous as well as arterial blood. Although the main purpose of this is, probably, the assimilation of crude blood coming from the digestive organs, it is not possible to say whether the bile is mainly produced from the blood of the hepatic artery or from that of the portal vein. That vein is supplied by branches from the stomach, spleen, pancreas, and small intestine. Entering the liver by two main branches, the portal vein subdivides and ramifies into the *interlobular veins*. These, as well as the minute branches of the hepatic artery, make the capillary networks, which surround the *acini* or lobules of the liver. From the centre of each of these lobules or "islets," goes off a ramule (intra-lobular vein) contributing

Fig. 128.

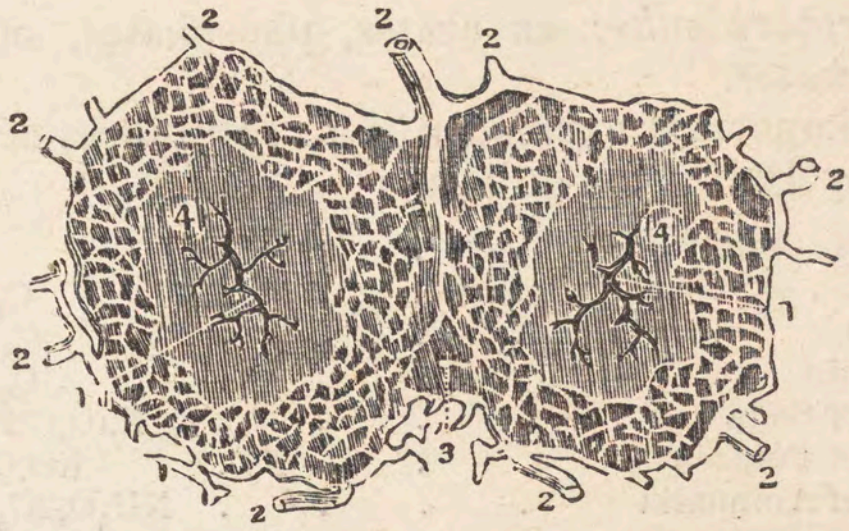


Lobule of Liver.

to the hepatic vein. From the same acini also pass off the tubules which carry bile, and which by combining make finally the biliary or hepatic duct. Among the capillary meshes of the acini, and inclosed within each, so as to be in direct contact with the biliary tubules, lie the *secreting hepatic cells.* These take from the blood materials from which they elaborate the bile.

Leaving the liver, the bile commonly goes backward through the gall-duct to the *gall-bladder*, where it is held in reserve, to be

Fig. 129.



Lobule of Liver.

forced out, by the *ductus communis choledochus*, into the duodenum, from time to time.

Human bile is yellowish-brown in color, and of a peculiar acrid or bitter taste. Its reaction to test paper is disguised by its bleaching litmus; but it is probably neutral when fresh, tending to alkalinity on keeping. It makes a lather-like foam when shaken in a tube. Nearly two and a half pounds of bile are estimated to be secreted by an adult in twenty-four hours.

Characteristic *ingredients* of bile are, *biliverdin* (coloring principle), *cholesterin*, *glyco-cholate* and *tauro-cholate* of *soda*; also, chloride of sodium, oleate, margarate, and stearate of soda and potassa, carbonate and phosphate of soda and potassa, and phosphates of lime and magnesia.

Biliverdin does not pre-exist in the blood. It must be formed in the liver. After its formation, it may be re-absorbed, when, for instance, the gall-duct is obstructed by gall-stones, and then it may be thrown out from the blood into the skin (jaundice) and tissues and secretions generally. It is a nitrogenous substance.

Cholesterin is a fat-like non-nitrogenous crystallizable substance, distinguished from the fats by not making soap with alkalies. It is not formed in the liver, but reaches it in the blood, being derived apparently from the waste of tissue in the brain and other parts of the nervous system, and from the spleen. Cholesterin is, according to the investigations of Prof. A. Flint, Jr., changed into other

urn

bilirubin or cholepyrrhin

(bilirubin & bilverdin — Dalton)

D.

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Bile

Urine

In jaundice from suppression (Harley)
there ought to be no biliary secretion in the urine;
the colouring principle there may be.

In jaundice from re-absorption, owing
to obstruction after secretion, both principles
of the bile ought to be thrown out in the
urine. Reabsorption occurs from
the gall-bladder, when the is abnormally
detained.

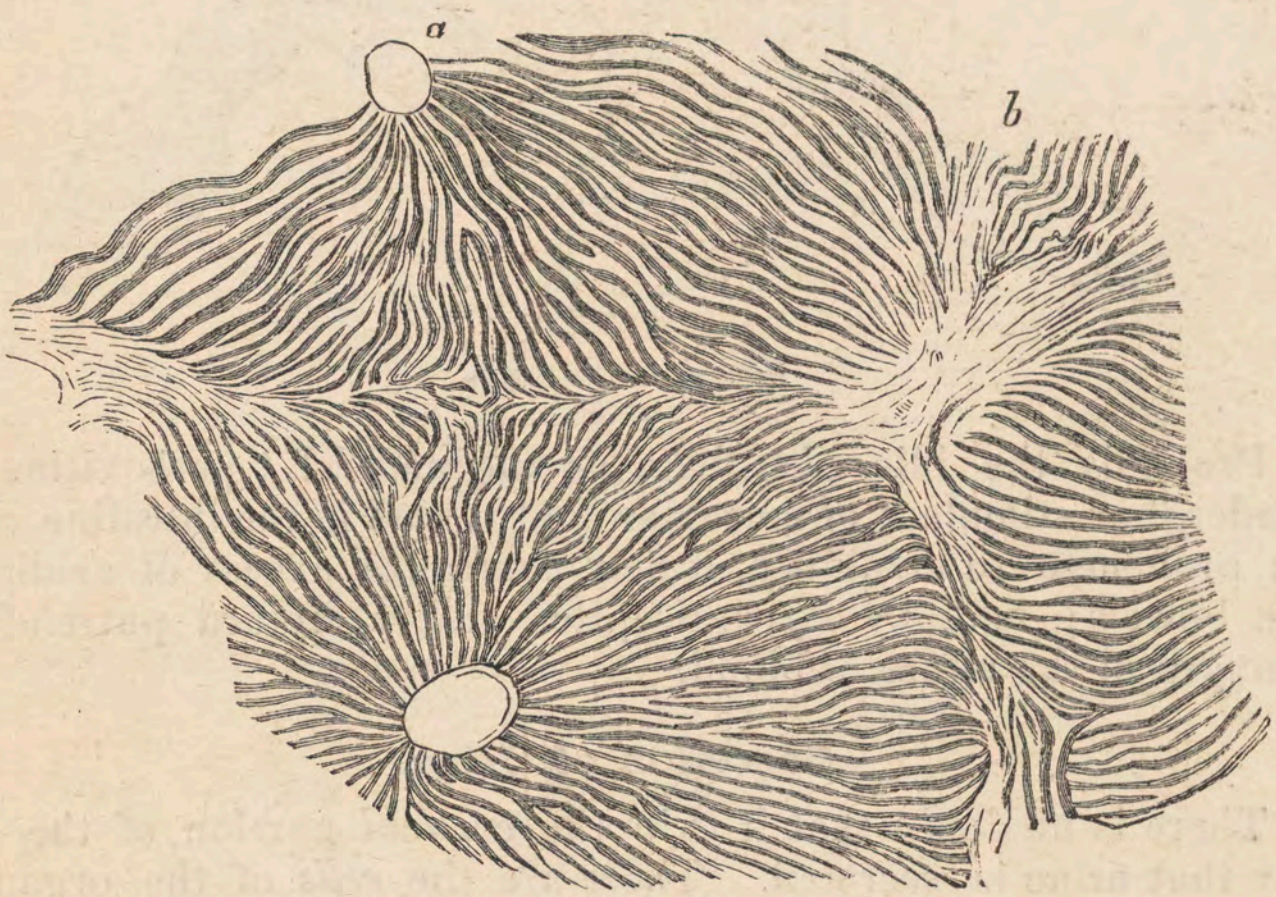
substances (stercorin, excretin) in the intestinal canal; not being found in the feces.

Bilin or *biliary resin* consists chiefly of *glyco-cholate* and *tauro-cholate of soda.* The former of these crystallizes readily; the latter with difficulty, if at all. They are distinguished also by the fact that the first is precipitated by acetate of lead, while the other is not. Both are nitrogenous; but tauro-cholic acid is peculiar in containing sulphur. These substances are *formed in the liver.*

Pettenkofer's test for bile is believed to be the best. It consists in mixing with the liquid to be examined a little cane sugar, and then adding sulphuric acid, drop by drop. A red color appears, changing gradually to lake, and finally opaque purple.

Biliary *coloring* matter, but not the resinous salts of the bile, is tested by nitric acid; which produces a green color with it.

Fig. 130.

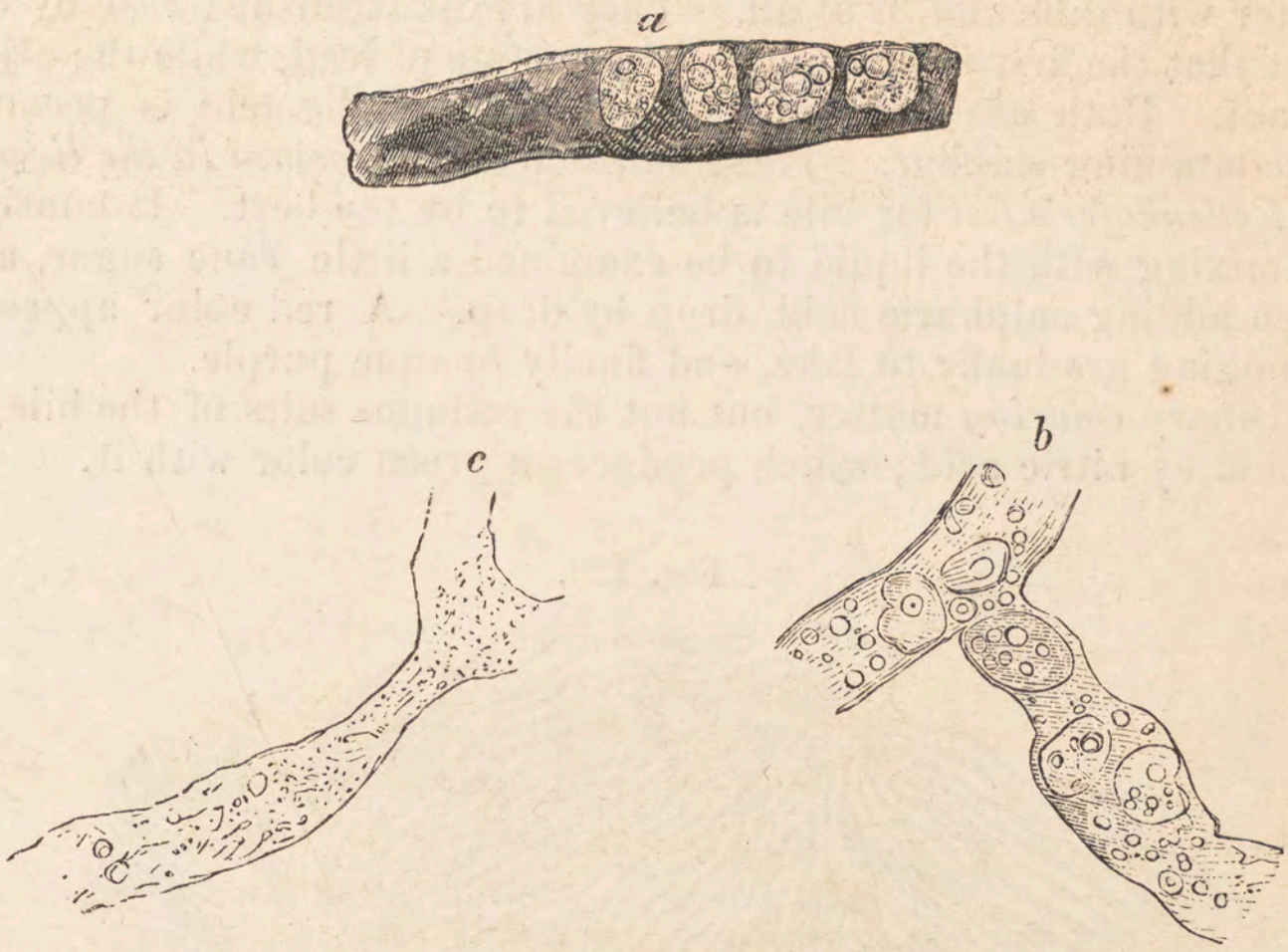


SECTION OF LIVER OF THE HORSE.

Uses of the Bile.—Most physiologists ascribe to the bile a share with the pancreatic secretion in the digestion of the fat of our food. It is usually secreted in largest amount not long after a meal. Nearly all of the biliary substances proper are reabsorbed from the intestine. Experiment shows that it is necessary to health and even to the life of an animal, not only that the bile should be secreted and discharged, but that it should be passed *into the alimentary canal.* All these facts combine to prove that it partakes in the completion of the digestive process. Against this, Dr. Dalton urges that experiments with bile out of the body

have not succeeded in showing that it has any positive reaction with either albumen, starch, or fat, at a temperature of 100°.

Fig. 131.



Bile-duct and Cells.

Probably the bile also acts as the natural "peristaltic persuader," or stimulant of muscular contraction in the intestine. By its proneness to alkalinity, it may neutralize excess of acidity in the bowels; and, by its antiseptic quality, retard putrefactive changes in the refuse of blood.

Secretion of Urine.

There is no doubt that it is in the *cortical* portion of the kidney that urine is secreted. There are the *cells* of the organ, in close relation to the beginnings of the uriniferous tubules, which then collect, in conical bundles, to end at the pelvis of the kidney. Capillary bloodvessels surround these cells; each minute tubule also begins in a capsule, which embraces a Malpighian corpuscle, or tuft of capillaries. Very possibly there may be an actual expression or filtration of a portion of the water and salts of the blood, from the Malpighian tufts, into the tubules, through the inclosing capsule. Besides this, however, there is a true *secretion*, or selective separation, of matters from the blood, by the cortical renal *cells*.

Urine is entirely excrementitious; serving, after it leaves the kidney, no functional purpose. Its ingredients are all taken from the blood; not manufactured, although perhaps somewhat modi-

HEIDENHEIM ON THE INFLUENCE OF BELLADONNA ON SECRETION.

KEUCHEL (*Das Atropin und die Hemmungsnerven.* Inaug. Diss. Dorpat, 1868) found that the dryness of the fauces, which follows the use of belladonna or atropia, is due

Sydney Ringer (*Practitioner*, August and October, 1872) finds that belladonna or atropia can prevent or check sweating, whether this be due to external warmth or to disease. When it is the result of disease, the subcutaneous injection of $\frac{1}{200}$th of a grain of atropia is generally sufficient to arrest it for one night. This dose does not dilate the pupils, but it produces dryness of the fauces. Stramonium has a similar effect.

to paralysis of the chorda tympani, which is the nerve regulating the secreting function of the submaxillary gland. This nerve contains two sets of fibres, one of which, as Ludwig has shown, acts on the gland-cells, and causes them to secrete; while the other set, according to Bernard, induces dilatation of the arteries of the gland, and thus supplies more abundant material for secretion to the cells of the gland. Keuchel did not determine whether atropia arrested secretion by paralysing the true secreting fibres in the chorda, or by destroying the power of the vaso-inhibitory fibres, and thus preventing a sufficient quantity of blood to supply the increased secretion from being furnished to the gland. Heidenheim (*Pflüger's Archiv*, v. 40) has investigated this question, and finds that, when the chorda tympani is irritated after the injection of atropia, no saliva is secreted by the submaxillary gland, but its vessels become dilated as usual. This shows that the arrest of secretion is entirely due to paralysis of the true secreting fibres in the chorda tympani, and not of the vaso-inhibitory ones. The experiment also affords a convincing proof of the separate existence of these two sets of fibres. Irritation of the sympathetic caused secretion after the injection of atropia, and the termination of the sympathetic filaments in the gland must therefore have a different relation to the secreting cells from those of the chorda tympani. When the paralysis of the chorda tympani which atropia produces is removed by physostigma, irritation of this nerve will again cause secretion. Sometimes, however, the secretion again stops, but this is due to quite a different cause from its arrest by atropia. The physostigma, as has already been said, restores the power of the secreting fibres, but it at the same time causes such contraction of the vessels that they do not dilate when the chorda tympani is irritated; and the supply of blood to the secreting cells is therefore too scanty to supply them with sufficient material for secretion. Physostigma also stimulates the roots of the chorda tympani in the brain and causes salivation, which ceases when the chorda tympani is divided. Nicotia and digitalin also stimulate secretion in the same way as physostigma, but large doses of nicotia paralyse the chorda. Dr

bolism). In some cases there is disease of the uterus itself or in its vicinity, and the ulcerative endocarditis may appear to be only a complication. But in other instances the uterus is quite intact, yet endocarditis developes and becomes the predominating disease. It is then purely rheumatic, and it is produced in the same way as rheumatism generally, viz., by exposing the heated body to cold. The absence of rheumatic affections of all the other organs too clearly shows that the heart possesses a greater vulnerability. Not only will an anatomical examination then reveal the presence of some deficiency of the vascular apparatus, but the history of the case also shows that disturbances of nutrition have preceded the outbreak of endocarditis. Of course it cannot be said that there exists a constant causal connection between chlorosis and ulcerative endocarditis, but still it must be admitted that chlorosis has some influence on its production.

In the non-puerperal state also, as well as in men, endocarditis tends to complicate a congenital narrowness of the aorta. This disposition, however, does not always result in the disease. There are cases where the narrow aorta is followed only by an enlargement of the heart. Simple dilatation, or dilatation with hypertrophy of the heart, is under such conditions found in men and women who are free from valvular disease and from chronic disease of the kidneys, especially granular atrophy. On the contrary, it appears that some diseases of the kidneys and of other parenchymatous organs are merely consequential on changes in the vessels; and it certainly deserves to be considered how far chlorosis forms the predisposing cause of grave diseases of those organs. The great frequency with which changes in the walls of the renal arteries are observed simultaneously with disease of the parenchyma of the kidneys, is well known; and if a narrow aorta be found in a case of hypertrophy of the heart combined with granular atrophy of the kidneys, the hypertrophy will certainly have to be explained in the way mentioned above.

Hypoplasia of the aorta often exists in young consumptive subjects of both sexes. It is especially in the cases of the so-called cheesy pneumonia, that a certain causative relation between chlorosis and phthisis will readily be recognised.

the circulation in them more active. The increased activity of the circulation he attributed to some change in the vaso-motor system of the hepatic vessels, which allowed their walls to relax in a similar way to those of the ear of the rabbit after the sympathetic has been divided in the neck. He ascertained that the formation of sugar could be greatly increased, and diabetes produced, by galvanizing the pneumogastric nerves in the neck, or by irritating their roots by puncturing them at their origin in the fourth ventricle. At the same time that the production of the sugar was increased by the puncture, the vessels of the liver became much dilated. It might thus have been supposed that the nervous influence which originated in the medulla oblongata and caused diabetes, passed down to the liver through the vagi. This, however, was not the case; for when these nerves were cut and their ends galvanized, diabetes was only produced by irritation of the central end, but not by irritation of the peripheral extremity. Diabetes could also be induced by puncturing the fourth ventricle, just as readily after the vagi were cut as when they were intact. If the splanchnic nerves were cut before the fourth ventricle was punctured, no diabetes was produced; but if they were cut after the puncture had been made, their section did not remove the diabetes which was present.

From these and other experiments, Bernard concluded that the air inhaled during respiration irritated the ends of the vagus in the lung; that this irritation was conducted up to the medulla oblongata, and was thence reflected down the splanchnic nerves to the liver, and caused the formation of sugar. By what way the nervous influence passed from the medulla to the splanchnics, however, was not ascertained; and no very satisfactory explanation could be given of the fact that section of the splanchnics after puncture of the ventricle did not remove the diabetes. Some light was thrown upon this question by the observations of Eckhardt and Pavy, but it has been reserved for Cyon completely to solve it.

Pavy noticed that section of the superior cervical ganglion of the sympathetic might cause diabetes; and Eckhardt found that it followed section of the last cervical or any thoracic ganglion, just as certainly as puncture of the fourth ventricle. Section of the splanchnic nerves did not produce it.

Eckhardt tries to explain this difference between the effect of dividing the ganglia and the nerves by supposing that diabetes is due to irritation of the ganglia by the exposure of their cut surfaces to the air, and that, when the nerves are divided between the ganglia, paralysis and not irritation is produced. If this hypothesis were true, diabetes should not occur when the ganglia are completely extirpated; but Eckhardt does not say whether it does or not, and therefore Cyon determined to perform this operation, and thus test the truth of Eckhardt's theory. When he cut through the last cervical or the first dorsal ganglion, he found, like Eckhardt, that diabetes was produced; but it occurred just as certainly when both ganglia, or even the last cervical alone, were cut completely away, or when the nerve-fibres entering this ganglion were all cut through, although the ganglion itself was never touched. This clearly showed that Eckhardt was wrong, and that the diabetes occurring after operations on the last cervical or first thoracic ganglia was due to paralysis of the nerves which were connected with them, and not to irritation of the ganglia themselves. He next ascertained that all the fibres entering these ganglia had not the same effect in causing diabetes, for it occurred when either the branches which pass along the vertebral artery from the spinal cord to the last cervical ganglion, or the two fibres which connect it with the first thoracic ganglion, were divided, whereas section of the other nerves proceeding from the ganglion did not do so. It thus became evident that the nerve-fibres whose paralysis causes diabetes, come from the spinal cord through the vertebral nerves to the last cervical ganglion, and pass from it to the first dorsal in the two connecting branches which, in their course from one ganglion to another, enclose the subclavian artery, and form the annulus of Vieussens. So much having been ascertained, it would seem easy enough to trace the nervous path down the gangliated cord and splanchnics to the liver; and one would expect that, by dividing the cord in the thorax, and thus paralyzing the fibres going to the liver, diabetes would be produced as certainly as when they were divided at the level of the vertebral artery.

Such, however, was not the case; for not only did subcutaneous division of the gangliated cord between the tenth and twelfth ribs not produce diabetes, but, if the cord were cut before or at the same time as the last cervical or first thoracic ganglion, the diabetes which would otherwise have occurred did not appear. But when diabetes was first produced, division of the cord did not diminish it, or even hinder its increase, just as Bernard had found with regard to the splanchnics. In order to explain this apparently contradictory result, Cyon set about investigating the way in which the fibres of the annulus of Vieussens affect the liver, and more especially the circulation in it.

On irritating these fibres, he found that a number of fine white lines appeared round the lobules of the liver, in the position occupied by the small branches of the portal vein and hepatic artery; and these were so numerous as to produce the appearance of whitish spots on the organ, which continued while the irritation lasted, and disappeared after it ceased. At the same time that these spots appeared, he noticed that any cut or tear in the liver bled less freely than before. This indicated that contraction of the portal vein or hepatic artery, or of both, had been occasioned by irritation of the annulus; but, in order to make assurance doubly sure, as well as to find out whether it was the artery or the vein that contracted, he put a T-canula into the hepatic artery and connected it with a manometer. On then irritating the annulus of Vieussens, the pressure rose in the manometer as much as thirty to seventy *millimètres* of mercury; while in the carotid it only rose five to ten *millimètres*. To remove the last objection which might be raised, and show conclusively that the rise of pressure was due to contraction of the branches of the hepatic artery in the liver, and not to any other cause, he compressed the artery beyond the point where the canula had been inserted, so that no change in the calibre of its branches could have any influence on the blood-pressure in its trunk. On again irritating the annulus, he found that no alteration in the pressure was produced. Division of both annuli produced, as was to be expected, dilatation of the branches of the hepatic artery, and fall of the blood-pressure in it. When the portal vein was experimented on in the same manner, the pressure only rose ten or twelve *millimètres* during irritation; and he thinks this is probably due indirectly to the change in pressure in the artery.

These experiments completely prove that the vaso-motor nerves of the hepatic artery are contained in the annulus of Vieussens; that their division causes the vessel to dilate, and at the same time produces diabetes. The theory of Bernard, that the diabetes depends on the dilatation, and on the consequent rapid circulation of blood in the liver, is thus rendered in the highest degree probable. But why should section of the splanchnics or of the gangliated cord prevent the production of diabetes, but not remove it when present? This Cyon also explains. These parts of the nervous system contain the vaso-motor fibres for the vessels of the intestines; and, when they are cut, the vessels dilate, and blood accumulates in them to such an enormous extent that there is either too little blood remaining, or it is under too low a pressure for the circulation in the liver to become increased above its normal, even although its vessels be dilated. When the hepatic vessels, however, are dilated first, the blood continues to pass through them, and diabetes continues, even although the intestinal vessels have become relaxed.

The researches of Cyon, along with those of Bernard, render our knowledge of the part which the nervous system plays in influencing the production of sugar in the liver, and in causing diabetes, in so far as this disease depends on increased formation and not on diminished combustion, tolerably clear, though still incomplete; and enables us to form some kind of idea of the manner in which opium and allied remedies prove beneficial. The irritation which the inspired air produces on the ends of the vagi in the lungs is conveyed up these nerves to the medulla oblongata, and there exerts an inhibitory action on the vaso-motor nerves of the liver. When the irritation is increased, as by galvanizing the vagi, the inhibitory action is so great as to produce complete paralysis of the vaso-motor nerves, and induce diabetes; and, on the other hand, when the vagi are cut, the vaso-motor nerves act more powerfully, causing the vessels of the liver to contract, and the production

of sugar to diminish, as Bernard found that it did. It seems, therefore, not improbable that the beneficial action of opium and its alkaloids is due to their lessening the excitability of the vagus. We can hardly suppose, however, that diabetes is not sometimes due, either in whole or in part, to diminished combustion; and the causes of this still remain a matter for future investigation.

GLEANINGS FROM OUR EXCHANGES.

POPLITEAL ANEURISM CURED BY FLEXION IN THREE DAYS.—The *Bulletin de l'Académie Royale de Médecine de Belgique* (*British Medical Journal*, December 23) contains an account by Dr. Larondelle of the cure of a popliteal aneurism of the size of an orange. Dr. Larondelle adopted Mr. Ernest Hart's method of forced flexion of the leg upon the thigh. There was œdema of the foot and leg. The bandage employed was applied after the fashion recommended by Mr. Hart in his first paper in the *Medico-Chirurgical Transactions;* and the patient, as in his second published case, was allowed to walk about the room with the help of a crutch. The bandage was solidified by starch. The flexion seems to have been forced a little in excess. At the end of the second day, as the patient was complaining much of the pain, the bandage was removed. A second bandage was applied, and on the third day the tumor was found to be solidified. The cure thus effected was permanent; and the tumor, at the end of five months, was reduced to the dimensions of a small, hard kernel.

FORCE AND ENERGY.—In some "Contributions on the Physiology and Therapeutics of Food," in the London *Lancet* for December 2, 1871, Dr. F. W. Pavy lays down the distinction between *energy* and *force*, as follows: "By 'force' in rigid signification is understood the power of producing 'energy;' by 'energy,' the power of performing work. To give an illustration: powder has force, the cannon-ball energy; but to speak of the force of the cannon-ball is inexact. I may also remark that the words 'actual' and 'potential' are in frequent use to qualify the state in which energy is met with. By actual energy is meant energy in an active state, energy which is doing work. By potential energy, energy at rest,—energy capable of doing work, but not doing it. In a bent cross-bow there is potential energy,—energy in a state of rest, but ready to become actual, or to manifest itself, when the trigger is pulled. Again, actual energy is evolved from the sun. By vegetable life this is made potential in the organic compounds formed. In these organic compounds the energy is stored up in a latent condition; potential energy is reconverted into actual energy when they undergo oxidation during combustion, or in their utilization in the animal economy."

FREQUENCY OF ULCERATIONS OF THE LARYNX IN SYPHILIS.—Jules Sommerbrodt (*L'Union Médicale*, December 2, 1871; from *Wiener Mediz. Presse*) has collected the following statistics in regard to the frequency of ulceration of the larynx in syphilis. Kühle has found ulceration of the larynx 15 times in 100 autopsies of syphilitic subjects, while Altenhofer has only met with it 25 times in 1200 patients. Gerhardt and Roth have observed it 18 times in 56 syphilitics, to wit: 11 times in 44 patients with secondary symptoms, and 7 times in 12 patients with tertiary symptoms. Lewin has found it in 44 patients out of 1000, and Engelsted in 25 out of 521. Out of 84 syphilitic patients observed by Sommerbrodt at the Allerheiligen Hospital, 15 presented ulcerations of the larynx in different stages, and 14 suffered from a catarrhal affection with hypertrophy of the mucous membrane. Moreover, in 238 patients affected with various diseases of the larynx, syphilis proved to be the predisposing condition in 45. This manifestation of the diathesis occurs at different periods after the infections. Turck observed it in a patient thirty years after the contraction of a chancre, and Frankl found it in an infant only two months old, in whom the first symptoms appeared a month after birth. Turck has observed it six months after infection; and Lewin, two or three months after the occurrence of the primary symptoms. The vocal cords are the parts most frequently affected. The left vocal cord is more often affected than the right, which, on the contrary, is the more usual seat of tubercular ulcerations.

GUNSHOT WOUND OF BOTH LUNGS AND OF THE RIGHT AURICLE OF THE HEART.—Dr. J. B. Roberts reports in *The Richmond and Louisville Medical Journal* for December the following post-mortem appearances in a man who had run sixty yards and lived an hour after the reception of a gunshot wound. The ball entered the right cavity of the chest between the sixth and seventh ribs, fifteen inches downward and backward from the sterno-clavicular articulation, twelve inches from the median line in front. The ball passed through the middle of the right lung, through the anterior wall of the right auricle of the heart, cutting its way through the anterior part of the upper lobe of the left lung, and emerged from the body between the fourth and fifth ribs, about two inches below the left nipple.

NUCLEATED BLOOD-CELLS IN LEUKÆMIA OF INFANTS.—Dr. Neumann (New York *Medical Journal*, November, 1871; from *Archiv der Heilk.*, 71, xii., 1871) has assured himself of the presence of nucleated blood-cells during life, by puncturing with a needle for a drop of blood. Besides numerous colorless granular cells of 0.005–0.012 mm. in diameter, which under circumstances of health present no nuclei, there were found single homogoneous pale yellow cells of 0.006–0.008 mm. in diameter, with a colorless or spindle-shaped nucleus, or with numerous granules (remains of nuclei). By the addition of acetic acid these latter cells lost their color, and within their contour, which appeared as a fine circular line, the somewhat yellowish-tinged nuclei and granules stood out with a sort of fatty glitter. Dr. Neumann is inclined to regard the presence of these transition-forms between colorless and colored blood-cells, which are produced by the diseased marrow of the bones, as a diagnostic sign of disease of the marrow in leukæmia, since in a normal state they are found only in the marrow, and there is no evidence that in leukæmia they occur also in other organs, provided they are not carried into the same. In proof of this, he asserts that he has found nucleated cells in the general circulation of new-born infants at term, and not alone (as has already been made known) in the pancreas, spleen, liver, and bony marrow. How long they remain after birth is not certain; they were absent in a child which died of peritonitis sixteen days after birth.

TRICOPTILOSE.—Under this name M. Devergie reports (*Annales de Dermatologie et de Syphiligraphie*, 3me année, No. 1) two cases of a disease of the hair which he believes has hitherto been undescribed. The scalp itself is unaffected, but the hair becomes dry and loses its glossiness, each hair presenting at several points fusiform enlargements. At the level of these enlargements two or three small filaments separate from the hair, their free extremities being directed sometimes upwards and sometimes downwards. As a consequence of this separation of the hair into filaments, it at length breaks. As the different hairs break off at different heights, and are divided into a number of interlaced filaments, the hair appears to be not only *crêpé* but tangled. No parasitic growth could be discovered either by M. Devergie or by M. Gubler. The only treatment which seemed to be of any use was the removal of the diseased hairs by the scissors and the employment of an ointment composed of turpeth mineral, butter of cocoa, and oil of sweet almonds. The name tricoptilose is given to the disease in consequence of the resemblance of the hairs affected by it to a feather.

THE INFLUENCE OF ALCOHOL ON THE TEMPERATURE OF THE BODY.—Cuny Bouvier (*Centralblatt*, No. 51), after calling attention to the fact that destruction of the spinal cord in animals at the level of the sixth or seventh vertebra produces an elevation of temperature, which persists and may even be increased after death, says that this post-mortem elevation of the temperature may be prevented by the administration of alcohol. The use of alcohol enables animals in which pyæmic symptoms have been induced to resist the fever much longer than when it has not been employed, and it will be remembered that in animals narcotized by alcohol no fever is excited by the subcutaneous injection of putrid matter.

whole made into an emulsion with gum, a little sugar, and mint-water, the resultant liquid is usually taken without complaint.

THE MOVEMENTS AND INNERVATION OF THE IRIS. By DR. H. GRADLE. Chicago. Pamphlet, pp. 56.

This brochure is a reprint from the *Chicago Journal of Nervous and Mental Disease*. It is a brief *résumé* of the results obtained by numerous experimenters on the physiology of the iris, and offers a very fair view of our present knowledge of the much vexed subject of which it treats. It is too brief to be satisfactory to the general reader; but the very numerous references to authorities make it valuable as a bibliography of the subject. The author has thrown no new light upon points still held in dispute. S. D. R.

SELECTIONS.

CHOLAGOGUES.—In Dr. Rutherford's and M. Vignal's experiments a modification of Röhrig's method was adopted. Dogs which had fasted for eighteen hours were curarized, and artificial respiration maintained. A canula was tied in the common bile-duct; the cystic duct was clamped. The bile flowed from the canula into a finely graduated cubic centimeter measure, and the quantity secreted was recorded every fifteen minutes. It was shown that this method of continuous observation yielded results far more reliable and instructive than that adopted by Röhrig.

Two experiments on the secretion of bile in dogs that had fasted for eighteen hours, and which received nothing more than the doses of curara used in all the experiments for the purpose of keeping the animals at rest, showed that the biliary secretion was not affected by the doses of curara given; that the biliary secretion, on the whole, somewhat diminishes in the course of an experiment lasting from six to eight hours, but that the chemical composition of the bile remains almost exactly the same. The curara was always injected into a vein; the various substances hereafter mentioned were injected directly into the duodenum; for this purpose the wound in the abdominal wall was opened, and the substances injected through the wall of the viscus.

Three experiments with croton oil showed that although it produced violent irritation in the alimentary mucous membrane in all cases, it increased the biliary secretion in only one instance. A high place is, therefore, not assigned to this substance as a stimulant of the liver.

Six experiments with podophyllin proved that this substance greatly increases biliary secretion. A definite statement regarding the composition of the bile before and after podophyllin will be given in the report. Röhrig's statement that aloes deserve a high place as a hepatic stimulant was confirmed by three experiments, in which the extract of Socotrine aloes was employed. The analysis of the bile (not hitherto given), however, showed that after aloes the bile is more watery; nevertheless, the velocity of secretion is so much increased that it certainly causes the liver to excrete more biliary matter.

Three experiments with rhubarb proved that it is a far more important hepatic stimulant than Röhrig has stated it to be. Doses of rhubarb were given nine times in the course of the experiments, and they never failed to excite the liver within half an hour after they were given. Analysis of the bile before and after rhubarb in all the three experiments proved the remarkable fact that, notwithstanding the greatly increased velocity of secretion after rhubarb, the bile-solids secreted by the hepatic cells are not diminished. The rhubarb appar-

ently calls forth an increased secretion of normal bile. Three experiments with senna proved that its power as a cholagogue is far below that of rhubarb. The bile is rendered more watery. Four experiments with the aqueous extract of colchicum proved that it is a very decided cholagogue. The bile was rendered more watery, but the increase in the velocity of secretion was such that the amount of biliary matter excreted by the liver was certainly increased.

Two experiments with the solid extract of taraxacum proved it to be a cholagogue, though not a powerful one. Two experiments with scammony proved that it has a slight cholagogue action. Of four experiments with calomel, the secretion of bile was slightly increased in one, but there was nothing but diminution of the secretion in the other three. Purgative action was produced in all. The bile was rendered more watery.

Two experiments with gamboge gave no evidence that this substance is a cholagogue. One experiment with castor oil confirmed Röhrig's statement that this substance has scarcely any cholagogue power. Two experiments with dilute alcohol injected into the stomach showed that after the alcohol was given, the secretion of bile slightly diminished.

In the report, a full account will be given of the post-mortem examination of the state of the alimentary canal (hitherto entirely omitted in such experiments), so that the effect upon the biliary secretion and that upon the intestinal mucous membrane can be compared.

It was shown that the increased biliary flow from podophyllin, rhubarb, etc., in these experiments could not be ascribed to reflex contraction of the gall-bladder, for this had been previously wellnigh emptied by digital compression, and the cystic duct had been clamped. Nor could it be ascribed to reflex spasm of the larger bile-ducts, for the exaggeration of the biliary flow was far too great and far too prolonged to be explained in this way. Reasons were adduced for regarding it as probable that the agents are absorbed, and act on the liver directly. It was not professed, however, that their *mode of action* was definitely settled, the experiments having had for their primary object a determination of the facts of the case.

The opinion was expressed that powerful purgative action tends to diminish the biliary secretion.

When a hepatic and intestinal stimulant, such as podophyllin, is administered to an animal that is not fasting, it is probable that—1, the liver is excited to secrete more bile; 2, the absorption of bile and food from the small intestine is diminished on account of the purgative effect.

In conclusion, it was pointed out that this research proposed to be simply a contribution to comparative physiological pharmacology; and that it was left to the clinical investigator to compare these results with those observed in human pathological conditions.—*British Medical Journal.*

INJECTION OF QUININE INTO THE TRACHEA IN INTERMITTENT FEVER.—Some years ago, Dr. Jousset, of Bellesme, travelling in the northern part of the Greek Archipelago, was called in the morning to see a Greek child, aged twelve, who was seriously ill. On arriving, he was informed that the child was delicate, and liable to febrile attacks, but had been in her ordinary health the day before, when she had been playing with other children. In the evening she had suddenly become pale and shivery, and the parents thought her dead; but after two hours or less she had partially recovered and fallen into a deep sleep. In the course of the night she had two more fainting-fits. When Dr. Jousset saw her, she was lying on a thin mattress on the floor, extremely pale, with deep-sunken eyes,—in a word, like

bile. It thus appears that podophyllin, rhubarb, aloes, and colchicum had the most marked effect in increasing the biliary secretions of the dog; and as to their mode of operation, it appeared most probable that they were absorbed and directly affected the liver, though on this point it was not professed that anything had been definitely settled. These experiments were opposed to those of Dr. Bennett, in so far as that he found podophyllin diminished the amount of bile secreted. The apparent explanations of this difference, was thought to lie in the fact, that in Professor Rutherford's experiments the dogs were kept fasting seventeen or eighteen hours, while in Dr. Bennett's the dogs had their usual food. As regards calomel, the results were certainly opposed to clinical experience with man, though it was shown that in the dog, as in man, calomel produced purgations, and could also salivate.—*The Lancet*, August 14, 1875.

instances in support of the latter opinion: A gentleman contracted syphilis in 1850. He married some years afterwards, and now has three blooming children. Another gentleman had syphilis in 1851, and his wife contracted syphilis from him directly. She had no children. Four years later the gentleman married again, and now has a fine family of sons and daughters. Two gentlemen of his acquaintance contracted syphilis to his knowledge, and have had large families of healthy children. The case is not so where the woman has contracted syphilis. A lady contracted syphilis from her future husband, who bit her lip. He was suffering from a secondary affection of the mouth. She married, but had no children by this husband, who died in three years. A few years later the lady again married, and gave birth to a dead child. In view of such facts as he has collected, he feels warranted in assuring his *male* patients that if they have been

tent that they should 'have a little water in their milk, or a little turmeric in their mustard, as they had been subject to for years past.' So while Somerset goes on paying £100 to 'the man at Bristol,' Dorset keeps its cash, swallows its dirt, and rejoices."

PUNCH ON LABORERS' COTTAGES IN ENG-

to the use of albumen as a mordant. — A curious little book has just been privately printed in England, entitled "Bibliotheca Nicotiana — a First Catalogue of Books about Tobacco," and comprising the title in full of about 170 separate works of various dates, from 1547 to the present time, upon the properties and uses of the weed; it is edited by Mr. William Bagge, of Shirle Hall, Sheffield. — "Ten Years of Gentleman Farming at Blennerhasset, in Cumberland," by Mr. William Lawson, is announced as soon to be published in England, "intended to give a candid account of the costliness and the failures, but the ultimate success of his coöperative experiment in agriculture." — Ireland produced in 1873 a crop of 2,683,060 tons of potatoes, a large increase over the yield of 1872, though the acreage devoted to the crop had decreased. — Unsuccessful attempts have been made in Italy to raise the tea-plant, and the experiment is now to be tried in the southern districts of Sicily. — *Punch* considers that Sir Garnet Woolsey performed a great chemical feat in getting gold out of Coffee. — Lake Neuchatel, in Switzerland, has been stocked with 150,000 young trout. — The King of Belgium is building a sea-side residence at Ostend, to cost $50,000, which is not a third of what some of our Yankee "sovereigns" spend for a "cottage" at Newport. — The London *Chemist and Druggist* says it is impossible to have the last word with a chemist, as he always has a retort. — Vesuvius and the surrounding peaks were covered with snow on the 29th of April, which was not exactly in accordance with the popular notions of an Italian spring. — A country druggist the other day told his clerk that he could dispense with his services, and since then he has dispensed without them. — An ingenious photographer photographs the ladies' column of the London *Times*, reducing the announcements to a size which is just legible, and he sends them to the persons interested, with a modest request for a shilling if approved. — The "Scientific Record" in *Harper's Magazine* is an admirable compilation, and the illustrated articles of history and travel are always excellent. — A California paper says that an Oakland young lady entered a drug store lately and wanted to see the papers for a week back, and the intelligent clerk showed her a roll of sticking plaster. — The *Scientific American* often reproduces elegant pictures of modern English architecture from the London journals that make this subject a specialty. — *Hearth and Home* has passed into the hands of the Graphic Publishing Company, and under their management will again become an illustrated journal. — The length of underground railways now in operation in London is about twenty miles, and they are being extended in various directions; the additional track now in progress of construction being about four miles.

LITERARY NOTES.

THE APPLETONS have reprinted *The Great Ice Age*, by Professor Geikie, a work which has made considerable stir in scientific circles abroad. It is the most thorough discussion of the glacial epoch that has yet appeared, and the conclusions to which the author comes, especially with reference to the relations of man to this epoch, are of great interest. Astronomers place the period of greatest cold for the northern hemisphere about 210,000 years ago. At that time, as Professor Geikie tells us, all the north of Europe and America was covered with ice, which formed enormous glaciers filling all the valleys and pushing far out into the sea. Then came a warmer period when life was possible in the lowlands, and the woolly rhinoceros, the mammoth, and the great cave bear flourished in Great Britain, followed, as the climate grew still hotter, by the elephant, the hippopotamus, and the lion. Another change brought back the ice, and there seem to have been several of these alternations of cold and warm periods. It was during one of the latter, according to our author, that man first appeared in Britain, where he was the contemporary of the mammoth and the hippopotamus. Then the land sank down into the sea, and the last great period of cold came on, when the mountain-tops of Britain and Scandinavia were islands of ice in an Arctic sea. Later still the land was elevated again, and the reindeer, the

dainty pocket volume by Roberts Brothers. [illegible] reprinted Sara Coleridge's *Phantasmion*, which is perhaps the most poetic fairy tale in the English language. It has long been out of print, and almost impossible to find in libraries or anywhere else. A new edition of it will be welcomed by thousands. *Some Women's Hearts*, by Mrs. Louise Chandler Moulton, is to be commended as a collection of stories wholly free from "sensationalism," and as pleasing as they are wholesome in tone.

Dr. Clarke's "Sex in Education" has called out quite a number of replies, direct and indirect, the most notable of which are Miss Brackett's *Education of American Girls* (G. P. Putnam's Sons) and *Sex and Education* (Roberts Brothers). The former has a value independent of its criticisms of Dr. Clarke's book. Miss Brackett's essay on female education, which fills a hundred pages, is admirable, and eminently worthy of being made a book by itself. It ought to be read by every teacher of girls, and by every parent or guardian of girls. Of the other papers in the volume, the one by Dr. Mary Putnam Jacobi seems to us the ablest, though some of the others are notable as giving important facts bearing on the subject under discussion. *Sex and Education* is a smaller book, containing criticisms of Dr. Clarke from a variety of sources. Some of them are exceedingly severe, and in our opinion unjust; others, while denying the doctor's conclusions, give him credit for "nobleness of purpose," and recognize the fact that "he does not oppose the education of women, but only the present method of education." We hope at some future time to be able to refer more at length to both sides of this interesting discussion.

The Harpers have now ready the edition for 1874 of their *Handbook for Travellers in Europe and the East.* It has been revised throughout, and some portions — Switzerland, for instance — have been entirely rewritten and materially improved. New maps and plans of cities have been added, making the whole number now more than a hundred. The work may be had in one bulky volume of about a thousand pages, or in three volumes which are sold separately. This will be a convenience for tourists who are going over only a part of the ground, if indeed it be not so for all who use it. It may be found, with other new books, at Noyes, Holmes & Co.'s.

Estes and Lauriat have sent out No. 11 of their "Half-Hour Recreations in Popular Science," containing *Coal as a Reservoir of Power*, by Robert Hunt, and Professor Clifford's paper on *Atoms;* also the second number of "Half-Hours with Insects," by A. S. Packard, Jr. Both these series are excellent in their way, and we are glad to learn that their circulation is steadily increasing.

The Young People's Magazine is a new juvenile monthly, published by Wm. Guild & Co., 11 Bromfield Street, Boston, at the low price of $1.50 a year. The first number is neatly illustrated, and contains 64 pages of entertaining and instructive reading for the young. The cheapness and merit of the magazine insure its success.

Dr. C. Murchison.

The functions of the liver are threefold. First, it is engaged in the processes of sanguification and nutrition. Long ago Magendie and others proved that assimilation was partly performed by this route. Much more recently Bernard and others have discovered the glycogenic function of the liver. Glycogen always exists in the normal liver, more abundantly during digestion, and especially four or five hours after a meal. It is probably derived chiefly from sugar and starch. The glycogen is stored in the liver cells. It is also derived, without doubt, from albuminates, for it increases after a purely flesh diet. Glycogen is not excreted in the bile, for the latter contains neither glycogen nor sugar. It is probably retransformed in some way into sugar, and reënters the blood; and in this very process of decomposition heat is evolved, thus connecting the liver with the generation of animal heat. Part only of the glycogen is decomposed in this way. It probably contributes much to cell-growth in the animal body, just as sugar does to cell-growth in plants. Glycogen has been found wherever there are active cells, and Hoppe-Seyler has shown that it exists in colorless blood-corpuscles as long as they possess the power of spontaneous movement, while it changes into sugar when this power is lost.

The participation of the liver in the process of sanguification is supported by an examination of the blood of the hepatic vein. The blood which leaves the liver is five or ten times more rich in colorless corpuscles than is the blood which enters it. The red corpuscles, also, of the hepatic vein are sharper in outline, and less soluble in water. There are also good grounds for believing that sugar and glycogen have an important function to perform in muscular action. Whatever, then, may be the other functions of the liver, there is no doubt that sanguification is one.

Secondly, the liver performs the function of the disintegration of albuminous matter. It is a blood-destroying, and blood-purifying, gland. The products of this decomposition pass out by other channels than the bile. There is, for example, little doubt that albumen and fibrine are disintegrated in the liver. Brown-Séquard has calculated that no less than eighty-six ounces and a half of fibrine are lost to the blood every twenty-four hours in its passage through the digestive organs and liver. There is evidence, too, that the liver is largely concerned in the formation of the nitrogenous matters eliminated by the kidneys. It has been abundantly proved that the amount of urea excreted is diminished by organic disease or destruction of part of the liver, as in cancer and abscess. Dr. Parkes found by careful investigation, that the deficiency of urea, and the extent of liver-substance destroyed, were in direct proportion to each other. In the early stage of liver disease, on the other hand, when the gland is congested and its functional activity increased, there is a rise in the amount of urea excreted. These circumstances point to the intimate connection between urea and the functions of the liver. But this has been more positively indicated by the results of recent experiments, which prove that urea can be largely formed in the liver, and that it may be actually found there. The blood contains more urea after passing through the liver; urea is more abundant after digestion; and lithic acid, which represents urea in birds, may be found in the livers of this class of animals. Everything, therefore, seems to point to the liver as connected with the disintegration of albuminous matter, the products of which are excreted by the kidneys. All these processes are attended with a production of heat. The liver has a healthy temperature of 104° to 106°, and the temperature of the hepatic vein is higher than that of the portal. So that after so many centuries we return to the position of Galen, and accept the liver as one of the centres of animal heat.

The third function of the liver is the secretion of bile, which is a highly complex fluid. The quantity of bile secreted by a healthy animal has been found to increase during digestion. Taking an average of the results obtained by the best experimenters, we find that a man of 160 pounds probably produces about forty ounces of bile in twenty-four hours. The exact amount of bile secreted must, however, vary considerably with the person and his circumstances. It must not be forgotten that the amount of bile excreted is a very small proportion of that secreted. According to Berzelius, only about one fortieth of the bile is actually discharged from the body. The remainder is undoubtedly reabsorbed on its way along the intestine. This process is part of the great osmotic circulation which goes on between the contents of the alimentary canal and the blood, and which is most abundantly represented by the secretion of gastric juice and saliva, and the fluids poured out by the pancreas and the glands of the intestines. All these pass again in great measure into the vessels, and the process well deserves the name of "the intermediate circulation." In the intestines the bile assists digestion; it aids in the absorption of fat; it facilitates the absorption of albuminous substances by precipitating peptones; and it seems to have some effect upon the formation of glycogen. It also stimulates the peristaltic movements of the intestine, and prevents decomposition. Part, as has been said, is excrementitious.

Heidenhain (1874)

has confirmed Bowman's account as far as [illegible]

by experimental observations.

R

16

Urine concluded

The Skin

Reproduction

fied, in the kidney.[1] The average daily amount in an adult is from thirty-two to thirty-five fluidounces. Its normal specific gravity (water being 1000) is 1020. Its quantity and character, however, both vary, even in health; and, greatly, in disease. Diabetes mellitus is marked by saccharine urine, which is very heavy; up to 1060 or 1070. Hysterical patients often have very abundant urine, pellucid and light; 1006 or 1005. *Albuminuria* is the presence of albumen in the urine. This occurs transiently in a number of diseases; permanently, in Bright's disease of the kidney.

Fig. 132.

Section of Kidney.

Diurnal variations take place in the urine in health. Dalton found that passed on rising in the morning to be dense, highly colored, and of acid reaction. During the forenoon, pale, light in weight, and neutral or slightly alkaline. In the afternoon and evening it becomes again dense, dark colored, and strongly acid.

The following are the constituents of the urine:—

Water	938
Urea	30
Creatin	1.25
Creatinin	1.50
Urate of soda, " " potassa, " " ammonia	1.80
Coloring matter and mucus	.30
Biphosphate of soda, Phosphate of soda, " " potassa, " " magnesia, " " lime	12.45
Chlorides of sodium and potassium	7.80
Sulphates of soda and potassa	6.90
	1000.00

Urea is a soluble, crystallizable, neutral, nitrogenous substance; of which the daily average passed by an adult in the urine is from 400 to 600 grains. It is increased by exercise and by highly animalized food. Out of the body, decomposition converts it into carbonate of ammonia.

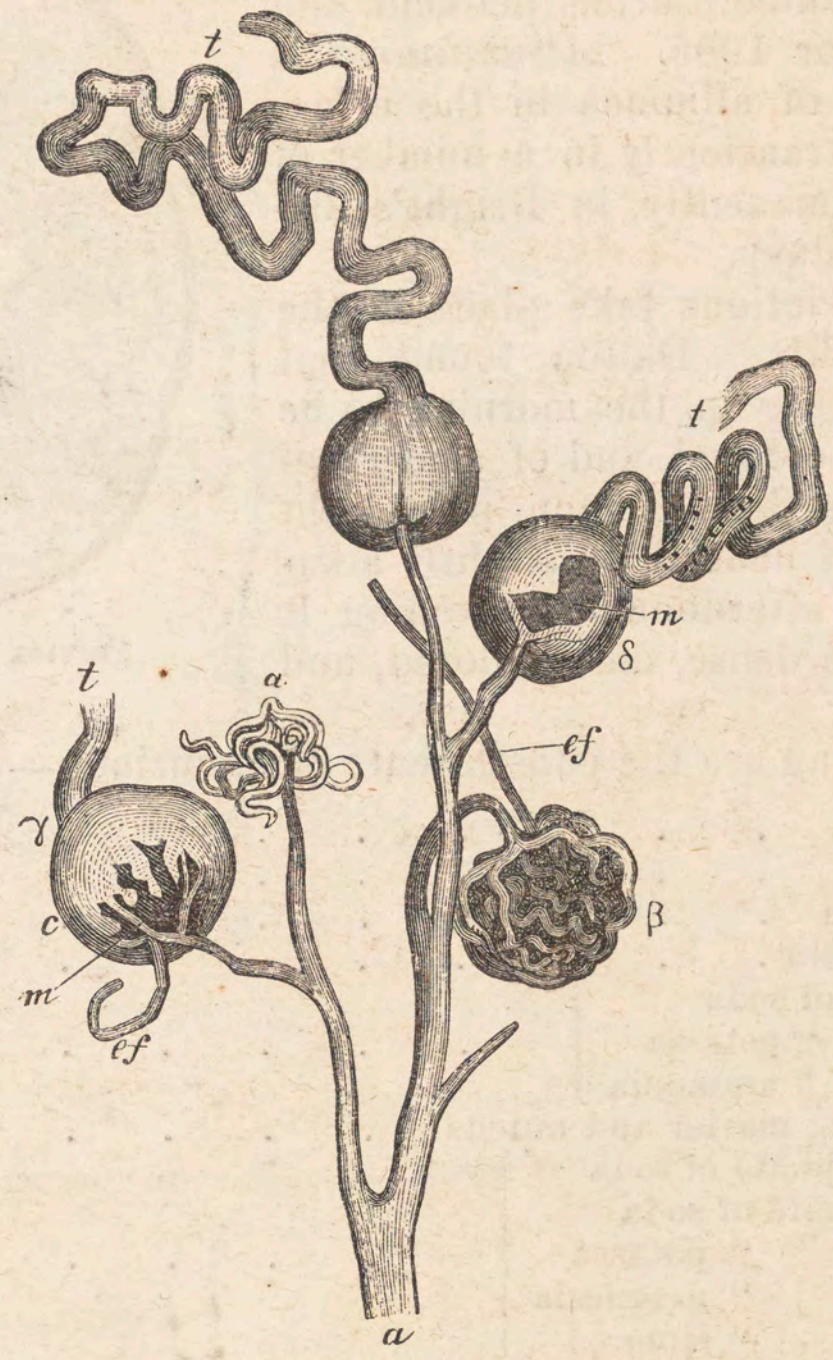
Creatin is a crystallizable, neutral, nitrogenous substance, origi-

[1] Zalesky asserts that the kidneys change creatin into urea.

nating in the muscular tissue as a result of its waste. Being absorbed into the blood, it is thrown out in the urine.

Creatinin contains two equivalents less of water than creatin. It is slightly alkaline. Muscular tissue yields it also. Probably creatin is converted into creatinin; as the latter substance is most abundant in the urine, and the former in the muscles.

Fig. 133.



STRUCTURE OF KIDNEY.—*a*. Arterial branch. *b*. Malpighian tuft. *ef*. Efferent vessel. *m*, *m*. Capsule. *t*. Uriniferous tubule.

Urates, or salts of uric or lithic acid, are soluble and crystallizable salts, containing nitrogen. Urate of soda is the most abundant. They result from the waste or disintegration of the nitrogenous tissues. The *rate* of *metamorphosis* of tissue, therefore, can be approximately estimated by determining the amount of urea, urates, &c., passed.

The *coloring matter* of the urine, *urosacin*, is usually dissolved in the water of the secretion. Sometimes it is thrown down with other deposits as uric acid or the urates; making the "lateritious" or brickdust sediment.

Gravel mostly consists of undissolved urates & uric acid.

Larger calculi in a majority of cases are of uric acid or urates; usually formed in concentric layers, almost or quite smooth outside. Strong liquor potassæ will dissolve these; & so will nitric acid, with effervescence; & the microscope will show crystals of uric acid.

Next common are calculi of phosphate of Calcium mixed with triple phosphate (of magnesium and ammonium); this being the calculus which is fusible by the blowpipe. Phosphate of Calcium calculus is generally smooth, even polished, outside.

Mulberry calculus is so called from its rugged, irregular structure; it is oxalate of Calcium

Cystine or Cystic oxide, & urostealith, are much less frequent.

Gouty habit, & Calcareous drinking water are the chief predisposing causes of lithiasis. It is sometimes hereditary.

Vicarious interchange between kidneys & skin.

Refer for urinalysis.

Uræmia:

Generalization about Excretion:

Gas & vapor by lungs —

Liquid, dilute saline solution through skin —

" denser by kidneys —

Solid or semi-solid by large intestine.

Carbon, by lungs chiefly; intestine next.

Nitrogen, effete, by kidneys mainly; urea & uric acid.

Hydrogen, " by all, in form of water, &c.

Sulphur, " through liver, by bowels, — also by kidneys.

Phosphorus, " by kidneys & large intestine.

Various medicinal and other substances pass from the blood into the kidneys, are thrown out by the urine, and give color, odor, or other properties to it.

Excretion by the Bowels.

In man, the large intestine has only an excretory function. The *feces* consist, 1st, of materials of food, not perfectly changed and rendered assimilable by digestion, from their nature or from excess in amount; 2d, of the secretions of the glands of the large intestine, viz., effete matter taken from the blood. The necessity of the regular action of the bowels for health is evident from this double nature of the material passed. Even when no food is taken, as in illness, *some* discharge, though it may be reduced in quantity, is required. In the feces, excretin, stercorin, ammonio-magnesian phosphate, and other salts, have been found along with remnants of undigested food.

The Skin.

Two important uses, besides secretion, evidently belong to the skin; *protection* of the organs beneath it, and the reception and conveyance of *sensation*. Two kinds of secreting glands are found in it; the *sudoriparous* or sweat-glands, and the *sebaceous* glands. The former are most abundant; on the palm of the hand, for instance, 2700 to the square inch. Each sweat-gland is a tubular coil, lined with epithelium, lying just beneath the skin. Its duct penetrates the skin, ending at the cuticle with an oblique valve-like opening. Altogether, nearly two pounds of perspiration pass off from the body of an adult in twenty-four hours. Its composition is as follows:—

Fig. 134.

Section of Skin.

Water	995.00
Animal matters, with lime	.10
Sulphates, with substances soluble in water	1.05
Chlorides of sodium and potassium, and spirit-extract	2.40
Acetic acid, acetates, lactates, with alcohol extract	1.45
	1000.00

The *sebaceous* glands abound especially upon parts of the skin covered with hair. Their secretion is unctuous, and maintains the

suppleness of the skin and hair. In the *external meatus* of the ear, the *ceruminous* glands discharge a matter of a peculiar consistence and odor, whose purpose seems to be to exclude insects from the ear.

Insensible perspiration is an exhalation of moisture from the whole surface of the skin. By its evaporation and that of the *sweat*, the heat of the body is moderated, under exercise, in summer weather or tropical climates. Thus, in a dry air-bath, the temperature of 250° can be readily sustained; in vapor, 150° would be dangerous. Chabert, the Fire-king, is said to have entered safely an oven heated to 600°.

CHAPTER V.

REPRODUCTION.

General Considerations

For the indefinite continuance of species of organized beings by the reproduction of individuals, the essential condition is the union of two oppositely polar or "sexual" cells; the *germ-cell* and the *sperm-cell*. In all the higher animals, as in man, these are always the products of different bodies, having concomitant sexual peculiarities. Among lower forms, animal and vegetable, true *hermaphrodism* is sometimes met with; *i. e.*, the existence of both sexes in the same individual; as in the tapeworm. Still, even if the uniting cells do not exhibit any palpable differences, the principle of *duality* seems to be universal in reproduction.

Apparent exceptions seem to exist to this law, in several instances. The propagation of plants from cuttings (as the grape-vine), or from "eyes" of tuberous roots (as the potato) is certainly not a *dual* process. If, then, it be infinite in its possible extent of multiplication, it must be exceptional. But we do not know that it is so. Degeneration of the potato and other plants under that method has been noticed. If this *multiplication by division* be exhaustible, it is really only the separate growth of dividual parts of the unit of organization from which they came. The tree grows in its cuttings; and, although their life is prolonged beyond that of the branches which are not planted out, it is still limited; only seed-life is perpetually renewable.

Other seeming exceptions occur in "parthenogenesis," or reproduction without impregnation, and the "alternation of generations" of certain animals (medusæ, salpæ, &c.), whose offspring are quite

—Spontaneous generation has received its quietus at the hands of Professor Frankland, of the Royal Institution of London. On July 18, 1870, he submitted, during four successive hours, a solution of fifteen grains of ammonia, five grains of phosphate of soda, and one ounce of distilled water, enclosed in strong glass tubes, to a temperature of 160 degrees C.=318 degrees Fahr., in order to kill any life which might be contained in it. To guard against the possibility of the entrance of atmospheric germs through minute pores in the glass which often exist unperceived, the tubes were immersed in cylinders containing oil of vitriol. For five months these cylinders were maintained at a temperature ranging from 60 deg. to 75 deg. Fahrenheit, and exposed to bright light—often that of the sun. With the exception of the bath of sulphuric acid, the experiment is completely identical with that of Dr. Bastian, which, it was claimed, actually proved the doctrine of spontaneous generation. Dr. Frankland, on December 24, 1870, opened these tubes in the presence of Professor Huxley and Mr. Busk. Bastian's description of the optical appearance of the contained particles was found to be perfectly exact. But, unfortunately for his conclusion that life was formed *de novo* in his bottles out of dead matter, powerful microscopes showed that all the living-looking particles were inorganic, many of them splinters of glass; and that the motion exhibited by them was not that of life, but the well-known rhythmic movement, known as Brownian. No trace of living substance was found after evaporating and treating with sulphuric acid. By this most decisive experiment, Pasteur's penetration and honesty in his celebrated controversy with Pouchet are fully vindicated, and Professor Huxley's rather warm language at the late meeting of the British Association more than warranted. After three hundred years' discussion, Redi's doctrine of Biogenesis, falsely attributed to Harvey, is victorious along the whole line—without life, no life, or all life from pre-existing living germs.—*World.*

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The sensory function of the skin is very important — & more so in man than in any other animal. Its relation to the nervous system is painfully illustrated in the effects of severe burns.

The absorptive action of the skin, (especially active in early life) has been remarked upon in connection with the use of remedies in treatment of diseases of children.

On Physiology of Reproduction:
Spontaneous Generation or
"Abiogenesis"—"Archebiosis."

On Sexual Hygiene:—

Hereditary influence on offspring.
Consumption—Cancer—Epilepsy—~~Ins~~ Insanity—Gout—
Tendency to Intemperance— Marriage of consanguinity:—Huth &c.
Periodical Headache— 1st Cousins—
Bilious Colic (Family Life)
& Gallstones!
Hæmophilia— Deterioration of womanhood organically in America.
Superiority of either sex—how, only (inch)
Female Education &
Coeducation. (Clarke &c.)
~~[illegible]~~
How Sex in Mind

Nature and

Correlations of Sex & of the
function of reproduction;
periodicity—development—&c.

2017 N. Nancy Place

Dear Doctor

I am tempted to send
you a letter of my own —
apropos to the subject of your
last lecture — which the Editor
of the Fortnightly Review did me
the honor to append to Dr
Maudsley's paper on Boy and
Education — It was merely
a private letter to Mr. Morley
but as opinion rather than
argument, and written while
in my own circle of friends
quite a number of middle-age
men were breaking down or
had recently died with

and — changed the name between the
ending of the essay and the award of the
prize! My friends at Cornell now claim the
highest success for co-education there — in
the two years since the Intelligible paper was
written, the results at Ithaca have converted
the opponents into warm friends of the system.

Very truly yours

Sarah C. Hallowell

wear and tear and often
of the brain from over anxiety
in business —

Elizabeth Garrett Anderson
replied to Dr. Maudsley in
a paper which rather evaded
the co-education question, Of
course in England an unbiased
problem, but which claims
the highest education for
women, apart.

I shall send Mr Hurley
the reports of the recent
Inter-collegiate contest in
New York, in which Julia
Thomas, a Cornell student
won the highest Greek prize

DRESS AS A CAUSE OF PELVIC DEFORMITY.—When the body is erect, says Dr. Aveling, in a discussion of this subject in the *Obstetrical Journal* for January, the influence of dress is of sufficient importance to demand careful attention. Attitude depends upon clothing more than is generally supposed. The stooping position, which has been referred to as injurious, is often produced by the peculiar feminine vestmental arrangements at present in fashion. The greater part of the burden of a woman's clothing hangs from the posterior part of her body. All the folds of her skirts are carefully disposed behind, and the swaying influence of their weight here is much increased by the leverage power granted them by the numerous ingenious devices adopted for insuring their projection backwards from the body. As the balance can only be maintained by inclining the body in the opposite direction to that in which it is drawn, it must necessarily be bent forward to counterpoise this retroverting influence. High heels also throw the body out of its proper balance, producing stooping, relaxation of the abdominal walls, and debased pelvic inclination. But dress, in its strictest sense, has still another potent way of causing mischief,—namely, by its weight when suspended from the waist; a weight not inconsiderable in itself, but rendered of much consequence by its persistent action. The bands, from which the garments that women wear hang, are chiefly supported by the abdominal walls and the viscera beneath them. Ultimately, therefore, they must compress the pelvic organs and cause their downward displacement. As a rule, all vestments should be carried by the shoulders. Long robes falling from them and girded at the waist are the least harmful, if not the most beautiful garments a woman can wear. If, however, it be absolutely necessary that her dress should be divided into two portions at the waist, let her by all means adopt some method of suspending the lower half from the shoulders. Braces of a very simple and inexpensive kind, having safety-hooks, which may be passed through the bands of the skirts, are now easily obtainable, and their general adoption is much to be desired. The position of the waistband must also be considered, for whether it should be high or low is a point of much importance. The fashion of short-waisted dresses is far more healthy. Long waists involve abdominal compression by stays, and that closer contact of bands with the walls of the abdomen which enables the downward dragging weight of skirts to exercise its influence most injuriously. The natural position of a woman's waist is neither high nor low, but in that part of her body which happens to be the smallest in circumference. If fashion would only allow this to be the proper place for the waistband, we should not, as now, have the constriction of stays and the

colors are capable of, it may be interesting to know that in the Gobelin tapestry manufacture twenty-eight thousand distinct shadings of yarn are employed, each one distinguishable by the practised eye.—*Journal of Applied Science.*

SLATE FOR ENGRAVERS.—As a matter of interest to any desiring illustrations, the discovery is worth noting that plates of polished slate may be used as substitutes for boxwood in engraving. It is stated that such engraved plates will furnish 100,000 impressions without loss of detail, and are not affected by oil or water. One drawback which they possess is that they are readily scratched, an objection from which wood is almost free.

STRATEGY VERSUS STRENGTH.—According to the *Cincinnati Medical News*, a Spanish physician, J. Fuentes, resorted to the following expedient in a forceps case. He says, "It was during the night, at an hour very unseasonable to call for assistance of a colleague; after fruitless attempts, my strength was entirely exhausted. I was all in a perspiration, and inexpressibly fatigued, when a practical idea occurred to my mind. I remembered how wire-makers pull the copper for wire. I procured at once a strong belt, which I fixed around my waist, and in it I hooked the free handles of the forceps that had been properly applied; then, holding my knees against the bedside and pulling methodically together with my waist and arms, I succeeded easily in bringing out the fœtus alive and free from injury."

POISONING BY NITRATE OF SILVER.—A case is reported in the *Brighton Guardian* in which a man hastily took a piece of lunar caustic, thinking it to be an anti-bilious pill. Soon after, he felt a burning in the throat. The patient said he felt the caustic in the right side of the throat, but his physician, Mr. Hart, searched for it with his finger, and could feel nothing. Two or three hours after, Mr. Hart was sent for, and found great difficulty of breathing, for which he performed an operation and carried on artificial respiration. But the man died. At the post-mortem, the stomach was found congested. "On examining the throat, at the back of the tongue he found a large black patch in the fold of the mucous membrane, where the poison had lodged. The passage into the lungs was completely blocked up, and the throat much swollen. Deceased died from suffocation." A similar case to the above, in which croup was caused by a bit of caustic dropping into the windpipe, is recorded by Dr. Albers, of Bremen, and mentioned by Christison.

WASHING out of the stomach, and the aspiration of liquids secreted by it, is more and more practised in Germany, since Kussmaul highly praised this method. Dr. Schliep uses it in nearly all affections of the stomach, especially in chronic gastritis, with or without dilata-

See Duffey's, Patrick Jacobs, & A. C. Brackett's reviews of G. H. Clarke; after Blackwell's Sexes Thro' Nature

Periodicity is (next to motion)

the most nearly universal of all the facts or laws of nature, in both the inorganic and the organic creation. In plants its rate of alternation and succession is mostly slow: e.g., sea-sonal (except in evergreens); at shorter intervals, in flowering and fruiting of many plants and trees (American aloe, once only in many years); diurnal in the opening and closing of petals of flowers; oscillatory and gyratory, in a few plants (oscillatoria, & tendrils of climbing plants).

In animal organisms, periodicity is most conspicuous & measurable in involuntary (& striped) muscles: as heart, arteries,

stomach & intestines, respiratory muscles;
next, in determinations of blood, in connection with various functions; and in
Secretion of fluids &c; slowest & most opposed contractions of action
in formative cell-processes — those of nutrition, development, repair.

Ovulation is an example of the last of these actions; all the
is permitted or at least
Copulation, with the discharge
that occurs into the uterus,
This is correlated, and more or less regulated,
coincident, with a physiological determination of blood to the uterus; followed
by the exfoliation of the delicate lining of the uterus, and the escape of (uncoagulated)
blood. This escape during health, is a normal physiological process; — not "elimination", nor, strictly, "waste"
but a provisional redundancy; adapted to the possible need of

Assuming these positions to be ~~established~~ — practical questions are —

1. what proportion of women are healthy — and how many, here and elsewhere, are invalids?

2. Supposing many to be invalids, so as to suffer disturbance at the monthly period, ~~how is this best to be~~ prevented: by a "regimen of sofas", or by proper, wholesome physical culture of girls and women, from childhood all through life?

we may answer, — assuredly ~~the~~ latter.

uterine extravasation

[illegible] organizable material for building up [illegible] In the absence of that use, it is removed as superfluous.

The economy is constructed in adaptation to the whole process; without (during health) interference with any other function.

Periodicity a General Law Of Nature.

Or Relation a particular instance under it.

Dr. Zakrzewska

Prof. Zachshefska

an early woman physician —

now in Boston

[From the AMERICAN NATURALIST, Vol. VI, December, 1872.]

ON THE RELATION BETWEEN ORGANIC VIGOR AND SEX.

BY HENRY HARTSHORNE, M.D.*

THE observations of Thomas Meehan upon the relations of sex in plants, published in the "Transactions of the American Association for Advancement of Science," and elsewhere, are entitled to the attentive consideration not only of botanists but also of students of general biology. In his papers of 1868, '69 and later, Mr. Meehan has endeavored to show that "it is the highest types of vitality only which take on the female form."† His facts have referred mainly to *Coniferæ* and *Amentaceæ*, although not confined to them.

The hesitation felt by many minds in regard to the acceptance of the above proposition has originated, chiefly, from the familiarity of the principle that "there is a certain degree of antagonism between the nutritive and the generative functions, the one being executed at the expense of the other;" along with the weight of some very familiar facts concerning the generally greater size and muscular strength of the male among animals (with a few exceptions, as in certain raptorial birds and arachnida), as well as the equally general superiority of male birds in voice and plumage.

Some of the facts in regard to plants cited in the papers referred to may *possibly* bear a different, even an opposite, interpretation to that given by Mr. Meehan. In his example of the larch, for instance, when we notice that after surviving several years of the repeated production of female flowers, the branches or spurs "bear male flowers and die‡," is it not possible that the demand for organic force required in the evolution of male flowers *causes*

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*Read at the Dubuque Meeting of the American Association for the Advancement of Science, August, 1872.

†Proçd. of Am. Assoc. for Adv. Science, 1869, p. 260.

‡Procd. Am. Assoc. for Adv. Science, 1869, p. 257.

their exhaustion? In another place* Mr. Meehan speaks of "the loss of power to branch," which in the Scotch pine, "the formation of male flowers induces." This view might comport, at least, with the ordinary statements of physiologists, as represented by Dr. Carpenter† who refers to the contrast between Algæ, in which individual construction is especially active, while the fructifying organs are obscure, and fungi, in which almost the whole plant seems made up of reproductive organs, upon the maturing of which the plant ceases to exist. This contrast between nutrition and reproduction appears again in the larval and perfect stages of insect life; the one being devoted to nutrition and the other to reproduction. Is there any doubt that, in the dahlia and other Compositæ *cultivation* alters *fertile* florets of the disk into *barren* florets of the ray? The gardener's common use of the principle of *limiting nutrition for the increase of reproduction* is alluded to by Mr. Meehan in his paper of 1870,‡ in speaking of a branch being "partially *ringed to produce fruitfulness.*"

But my purpose in the present paper is especially to call attention to a few well known facts in the animal kingdom, of a character somewhat analogous to those dwelt upon above concerning plants; which conspire with these, in suggesting that some qualification or addition may be required to the ordinary statements concerning the relations between nutrition and reproduction; or at least as to those between organic vigor and sex.

Take the instance of the common hive-bee (*Apis mellifica*). According to the observations of Dzierzon, Von Siebold, Leuckart and Tegetmeier upon hive-bees, and of F. W. Putnam, J. Wyman and Gerstæcker upon humble-bees, it appears that there is a regular gradation in rank, so to speak, of bee offspring, according to the method of their production. First and lowest in the hive-bee series are the males or drones. These may be sometimes produced by an unfertilized working bee; commonly, by a queen bee from ova not fertilized with sperm-cells, which cells, as observation and experiment both have shown, may be for a long time detained in the spermotheca charged with them. A queen whose fecundation has been delayed till she is older than usual, is apt to yield only drone offspring. The next stage in rank is that of the

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* Procd. Acad. Nat. Sciences, Phila. 1869, No. 2, p. 122.
† Principles of Comparative Physiology, p. 147.
‡ Procd. of Am. Assoc. for Adv. Science.

worker, or undeveloped female. Every one knows the remarkable effect of nutrition upon its characters; a change of cell and food elevating it to the full endowments of a queen. Putnam and Gerstæcker* have noticed among humble-bees what are called "large queen larvæ," intermediate between the workers and the perfect queens; and Wyman has suggested that the earlier or later period of impregnation may determine this difference; those first impregnated becoming queens, then the large queen larvæ, next the workers, *last the males.*

Now among the Aphides as well as to a certain extent in some Molluscoida, Cœlenterata, etc., we find a class of facts, different from these but yet allied to them. Taking Huxley's summary of the history of aphidian parthenogenesis,† it seems that the number of successive viviparous *pseudovan* broods is "controlled by temperature and the supply of food." The *agamic* viviparous individuals are regarded by Steenstrup and others as *non-sexual.* If sexual, they must be considered as females undeveloped. At all events, the coming on of cold weather begins the production of males as well as females. Packard's expression is that "the asexual Aphis and the perfect female may be called dimorphic forms." Of the three forms, then, that one whose production especially attends the conditions of the lowest vitality is the *male.*

But another class of facts of a quite different kind may be considered in this connection; involving higher animals and even man himself. I refer to the history of monstrosities. Double monsters (of which some remarkable human instances have been exhibited within a few years in this country) are always of one sex and *nearly always of the female sex.*‡ There is reason to exclude from this class of true double monsters cases like that of the Siamese Chang and Eng, who may be regarded as really twins with two complete bodies abnormally united together.

Now, why should a double fœtus nearly always have the female sex? The bearing of this question upon that which we have just been discussing appears, when we consider the true theory of double monsters. Under the close investigations of St. Hilaire, Virchow, Vrolik, Fisher and others§ it has been made quite evident that

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* Packard's "Guide to the Study of Insects," p. 119.

† Linnæan Transactions, xxii, p. 198.

‡ G. J. Fisher, Trans. Med. Soc. of New York, 1865-1868. Against this I find only a vague expression of W. Vrolik (Cyclop. of Anat. and Physiol., Art. *Teratology*, p. 946) that "some sorts" of double monsters are more frequently male.

§ Goodell, Philada. Med. Times, June 15, 1871.

PUBLIC LEDGER
AND DAILY TRANSCRIPT.
Philadelphia, Friday, January 7, 1876.

LOCAL LONGEVITY.

A record was published in the Ledger of July 1st embracing the cases of longevity in our obituary columns during the first six months of 1875 where the deceased persons had lived to or beyond the advanced age of eighty years. The total for that period was 386, there having been 155 male and 231 female octogenarians. During the last half of 1875, ending December 31st, there appeared in the Ledger announcements of the deaths of 289 persons who had lived to or beyond the age of eighty years, of whom 99 were males and 190 females—the latter outnumbering the former by 91. The total number of the deaths of octogenarians announced in the Ledger during 1875 was 675, there being 254 men and 421 women—the latter outnumbering the former by 167, and making more than three-fifths of the whole number. The total for 1875 is 136 greater than for 1874, and all these statistics show that the women living over eighty years not only outnumbered the men, but they also were the longest lived, there being many more women than men who lived beyond ninety.

Of the two hundred and fifty-four men who, during 1875, died at or beyond the age of eighty, the following numbers reached the various ages designated: 80 years, forty-seven; 81, twenty-one; 82, twenty-six; 83, twenty; 84, twenty; 85, sixteen; 86, twenty-six; 87, seventeen; 88, thirteen; 89, six; 90, thirteen; 91, eight; 92, two; 93, three; 94, four; 95, one; 96, three; 97, two; 98, one; 99, one; 102, two; 103, one; 108, one.

Of the four hundred and twenty-one women who during 1875 died at or beyond the age of eighty, the following numbers reached the various ages designated:—80 years, fifty-eight; 81 forty-seven; 82 thirty-five; 83 forty; 84 thirty; 85 forty-seven; 86 twenty-two; 87 twenty; 88 twenty-six; 89 twenty-one; 90 sixteen; 91 eight; 92 seven; 93 ten; 94 six; 95 nine; 96 two; 97 four; 98 seven; 99 one; 100 three; 102 one; 105 one.

as the Committees on Foreign Affairs and Military Affairs, to which were referred that portion of the President's Message in regard to these depredations, could not act jointly on the subject.

Mr. Reagan, of Texas, advocated the resolution, and said the authorities of Texas would not be able longer to restrain the people of that country from taking up arms in their own defence, a thing which might be greatly to be deplored. Taking into consideration the danger of international complications, he believed that some committee ought to be charged with the whole question.

Mr. Hancock, of Texas, also advocated the resolution, and spoke of the necessity of avoiding war and maintaining peace on the frontiers. He spoke of the incursions of the Mexican marauders to a distance of fifty, seventy-five, or one hundred and twenty-five miles into Texas. He was not complaining of the Government of Mexico, for he realized the comparative inability of that Government to preserve order and peace on its borders. The people of Texas were disposed to act with the greatest forbearance towards Mexico, but they thought that means might be found to afford adequate protection to them.

Mr. Hale, of Maine, called attention to the danger which always attended the appointment of select committees. A select committee had but one subject to deal with and naturally exaggerated its importance. He thought that instead of avoiding complications a select committee would tend to complicate the Government, and therefore he was in favor of leaving the matter where it now was, in the hands of the Committees on Military Affairs and Foreign Affairs.

Mr. Mills, of Texas, favored the resoluti on, and referred to his failure in the previous Congress to get the Military Committee to take any action in the matter, although Gen. Sherman had testified before it as to the Mexican incursions into Texas. There was there a Territory of 1000 miles in extent kept in a state of constant warfare.

The regular committees of the House, frightened by the question of diplomacy, had done nothing for the protection of that frontier, They had not discharged their duties to that State, and he supposed the same thing would occur again. In the appointment of the committees of this house it had not been thought necessary to place a member from Texas on the Military Committee, although that State had 1000 miles of border exposed to the ravages of Mexicans and Indians, nor had it been thought necessary to place a member from Texas on the Indian Committee, although the scalps of Texans were being constantly taken by Kiowas and Comanches.

Mr. Frye, of Maine, asked Mr. Mills whether the proposition to reduce the army was for the purpose of protecting the fron-

they result not at all from the fusion of two embryos into one, but, on the contrary, from the abnormal *fission of a single ovum*, under *excess of formative force*. The point for us now to notice is the nearly constant association of this profusion of developmental force with femininity of sex.

Regarding the actual function of this force (however we may designate it, as, *e. g.*, life force, organic force, bio-plastic force, etc.) as being the formation of plasma with attendant cell-multiplication or *vegetative repetition*, it would appear that *this* is precisely what, in plants and animals, may be the especial feminine endowment. The two directions or modes of manifestation of this organic force are individual construction and reproduction. These may, therefore, be in inverse proportion to each other, simply because the energy or material consumed in the one process is taken from the other; and yet, while a *certain* limitation of food and temperature favors reproduction, rather than individual nutrition and construction, a *greater* lowering of these conditions of vitality will retard, arrest or degrade both processes. According to Meehan's interpretation of his facts concerning plants, one effect of this lowering, retardation or degradation is the production of the male rather than the female sex. Some facts, at least, in the animal kingdom, as we have seen, support the same view; but to give a statement of this kind the form and validity of a law would require a much more extensive survey of correlated facts. At all events, we do not find the frequent superiority of the masculine sex in certain particulars in the higher animals necessarily incompatible with this; since this superiority prevails usually in apparatus not of the functions of the *vegetative* or organic life, but of *animal* life or of relation; as of *intellection*, *motor* power and *voice*. Beauty of plumage in birds, while we naturally attribute to it a certain superiority, may not, in the scientific sense, unequivocally have this character. If it should be conceded that it has, we must then regard its general predominance in males as one of the difficulties in the way, at present, of any extended or final generalization upon the subject. (The remainder of the paper was occupied with the application of the same course of reasoning to the study of the law of increase of human population.)

f.

(164)

Reproduction continued

Bouchet & Bastian pro. (Owen – Bennett – Clark)

Pasteur – Huxley – Frankland – Calvert – con.

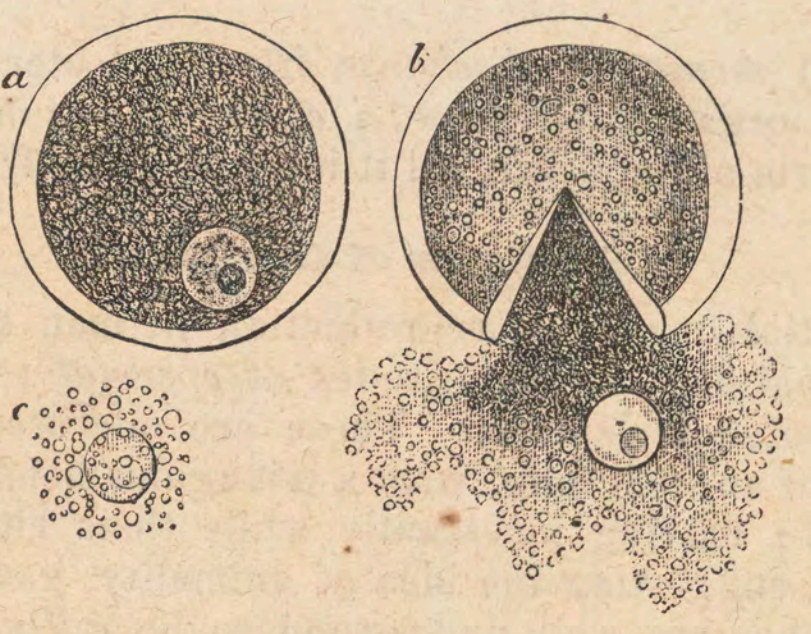
different from themselves. Careful examination has, however, shown that, while it may sometimes be deferred for several generations, sexual union does at intervals always occur. This is not necessarily in the bodies of the animals; as, in the case of fishes, the *spawn* and *milt* meet in the water outside of both parents.

Parasites within the cavities of the human and other animal bodies were once a serious puzzle to physiologists. It is now well understood, however, that all of them must be, and can be shown to be, derived from other, like or unlike, forms whose germs enter the body in food or drink, through the skin, or by being variously deposited as eggs. So, the tapeworm comes from the *cysticercus*, swallowed while very small, in food.

Some facts have often suggested the idea of "spontaneous generation;" that is, of the springing up of life in previously inanimate organic matter. Vegetation and animal life do certainly appear often, on the surface of decaying liquids and solids, without visible sources of origination. Any infusion of organic matter, left exposed to the air for some days in warm weather, will display under the microscope a number of animalcules and minute but definite vegetable growths. These, at least those whose motions give the idea of animality, are called *infusoria*. Do they ever begin to exist without previous germs?

Nearly all physiologists and naturalists are now agreed that the atmosphere and common water, which "teem with life," are always the sources of such development, by the ordinary methods of reproduction from parentage. Some experiments of Prof. Jeffries Wyman would seem to have settled this point fully. Having, with the greatest care, prevented all air except what had been

Fig. 135.



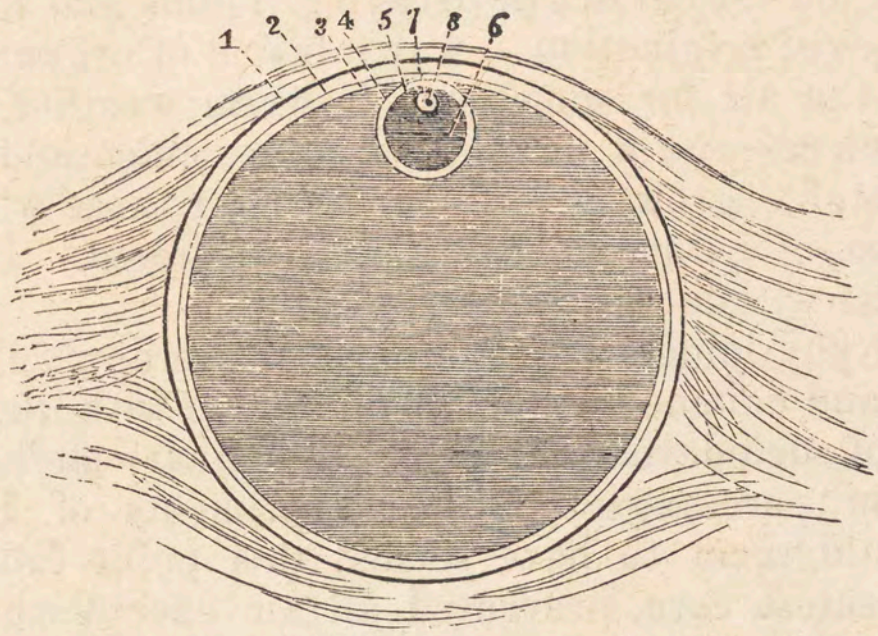
UNFERTILIZED OVUM.—*a*. Vitelline membrane, inclosing the yelk and germinal spot. *b*. The germ-cell, burst. *c*. The germinal vesicle, surrounded by granular matter.

exposed to high heat and disorganized by sulphuric acid, from reaching a preparation of organic matter, he found the number of

infusoria and vegetations produced to be greatly diminished. Some appeared, even after four hours' boiling of the materials. After *five* hours' boiling, however, *none appeared.* This shows, first, that the resistance of some of these minute germs to the destructive action of high temperature is greater than had been supposed; and, also, that a certain degree and continuance of such exposure will destroy *all* living particles; after which none are spontaneously produced. *Omne animal ex ovo,* Harvey's dictum, is then verified.

Of woman, the *ovary* is the primary organ of reproduction. In it the ova are produced, and, once a month, an ovum is thrown off, by the Fallopian tube, into the uterus. If not impregnated by sexual intercourse, it is then carried out by the (mucous and

Fig. 136.



Graafian Vesicle and Ovum.—1. Stroma of ovary. 2, 3. Tunics of Graafian vesicle. 4. Cavity of vesicle. 5 Yelk-sac. 6. Yelk. 7. Germinal vesicle. 8. Germinal spot.

hemorrhagic) *menstrual discharge* from the uterus. This, the womb, is the organ of *gestation; i. e.,* the retention of the embryo during the term of fœtal life, till it is *viable* apart from the mother.

Male Organs of Generation.

The essential organs of reproduction in man are the *testicles.* In the seminal fluid are multitudes of *spermatozoa,* on which its generative potency depends. These are microscopically minute bodies, $\frac{1}{600}$ of an inch long, with a triangular head and elongated tapering tail; moving incessantly while their vitality continues. This motion, suggesting the idea of animality, gave rise to their name; but they are well understood to be *cell-filaments,* with a motility like that of some other reproductive forms, vegetable as well as animal, but not animalcular themselves. Perhaps each spermatozoon may be a ciliated cell, with but one cilium, the tail.

When the spermatozoa become dry, or are subject to extreme

P.

17

Reproduction concluded

Muscular Action

SYPHILITIC SEMEN.

BY ISAAC SMITH, JR., M.D.

I ASK the indulgence of the readers of the *Times* for the further consideration of the question, Is semen of a syphilitic patient a vehicle of infection? which was raised by my report of a case in the November number of the *New York Medical Journal*, page 499. This question, which has been so ably, impartially, and scientifically discussed by R. W. Taylor, M.D., in the pages of the *Times*, February 27, demands all the light that can be thrown upon

spermatozoon could offer no very insurmountable obstacle to transudation, and as surely it seems that it might follow where a blood-disk leads into the circulation.

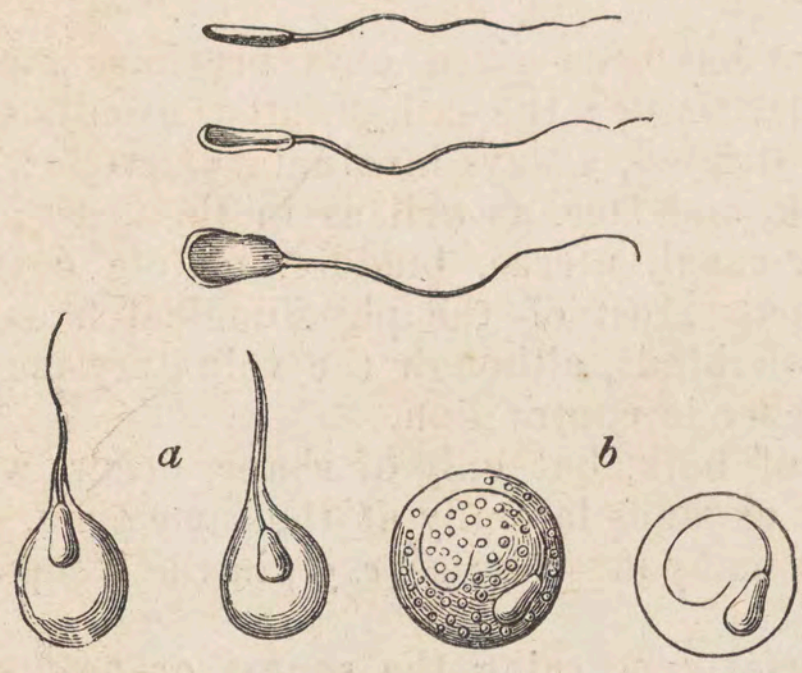
The following lines extracted from a lecture on life and on vital action, by Prof. Lionel S. Beale, M.A., F.R.S. (*London Lancet*, May 15, 1875), may not be uninteresting in this connection:

"The bioplasm of a human spermatozoon, which, perhaps, hardly weighs as much as the one-hundredth part of a single red blood-corpuscle, may stamp with unmistakable individual characteristics several tissues and organs which in their fully developed state weigh many pounds." Again he

heat or cold, or to disorganizing agents of any kind, they cease moving directly. Otherwise, it is probable that (in the genital organs of the female, for instance, after coitus) they may sometimes retain their vitality for hours, or even days.

Kölliker's account of the formation of the spermatozoa is as follows. At and after puberty, there are formed in the seminiferous tubes of the testicle certain vesicles; each containing from one to twenty nuclei, with nucleoli in them. In these vesicles, probably from the nuclei, the spermatozoa are developed in bundles. Then the vesicle gives way and disappears, and the spermatozoa are set free in the ducts, with a very small amount of fluid. This mingling of the spermatozoa occurs in the *rete testis* and head of the epididymis.

Fig. 137.



SPERMATOZOA.—*a*. Spermatozoa of the squirrel. *b*. Spermatozoa of the dog; two inclosed in the sperm-cells, and three free.

Passing through these and the *vas deferens*, a glairy mucus is added, and the material is accumulated in the *vesiculæ seminales*. When the sexual orgasm takes place, contraction of surrounding muscular fibres expels the semen from the vesiculæ seminales into the urethra. There it receives the secretions of the prostate gland, the glands of Cowper, and the mucous follicles of the urethra; all of which are excited together, by the act of coition. Entrance of the seminal fluid into the uterus is necessary for impregnation. Sometimes certainly, perhaps usually, a portion of it passes through a Fallopian tube to an ovary.

Periodicity in reproduction is observed in many animals. In the human female, monthly ovulation occurs, with the menstrual hemorrhage. Difficulty exists in ascertaining whether any regular periodicity is normal in the male. Observation makes it not improbable that a special proclivity to seminal secretion and discharge exists, in continent persons, about once in two or three weeks.

Like the mammary glands in the female, it is known that the testicles may, in the absence of excitation, remain inactive, so as for long periods to be free from discharge, without inconvenience. These organs, however, like others in the body, are excited to secretion by mental and emotional, as well as by physical stimulation.

CHAPTER VI.

MUSCULAR ACTION.

Some account has been given, on a previous page, of the two sorts of muscular tissue; the red, striated, usually voluntary, and the white, non-striated, always involuntary muscle; the former in the limbs, trunk, and face, as well as in the heart; the latter, in the alimentary canal, uterus, bladder, middle coat of arteries, gland-ducts, etc. Most of the physiological facts to be stated are true of both kinds, although the voluntary muscle-fibres are always the quicker in contraction.

No change of bulk, but only of shape, occurs when a muscle shortens; as it expands laterally at the same time. This may be seen and felt in many muscles; as, *e. g.*, in the biceps muscle of the arm.

Several *theories* concerning the source or nature of muscular power have been proposed. Haller, long ago, showed that contractility belongs to the muscular tissue itself; not *depending* on the nervous system, though ordinarily called into action under nervous influence. *Electricity* has by many been thought to afford the means of explaining muscular power; the analogy being closest, perhaps, to electro-magnetism, as that used in the telegraph. Matteucci's and Dubois Raymond's experiments are considered by Dr. Radcliffe to sustain an electrical theory.

Dr. B. W. Richardson has lately urged with emphasis the importance of the direct relation between *caloric* (heat) and muscular power.

Chemical change, similar to that which generates animal heat, all agree in believing to be either a cause or an accompaniment of muscular action. Many physiologists have supposed the change to be disintegration or waste of the *muscle itself*; that the consumption of the muscular tissue might be the source of the power. Some late experiments seem to contradict this view; especially those of Fick and Wislicenus; who found that, in a day's journey, climbing one of the Alps, there was no decided increase in the

—It is said of Mrs. Irving, the winner of the Greek prize in the recent inter-collegiate college contest, that she is tall, slender, nervous and active, dresses for health, and in a style to suit herself, is a famous pedestrian, and has always had an ambition to do Europe on foot. Last summer she and a few of her Cornell companions took their skiff at Ithaca and rowed down Cayuga Lake, up the Seneca river to Geneva, thence up Seneca Lake to Watkins. They visited the famous glens and all the romantic scenery of those beautiful lakes, tenting out all the time, and returned to Cornell in the same manner.

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amount of nitrogenous waste (measured by the urinary solids) beyond that of repose. It would seem to be the *non-nitrogenous* material of the blood, supplied by food, that is consumed for the production of muscular power.

Only the *contraction* of any muscle is active. Its dilatation is produced sometimes by elasticity, often by opposing muscles. Almost every muscle in the body has its antagonist. So there are, for the limbs, the flexors and extensors; for the fingers, adductors and abductors; at the anus, the sphincter and levator ani, etc. All muscles have, during life, a continued slight *passive* contraction. Since the opposing groups of muscles are not exactly equal in power, the position of parts of the body when at rest is determined by the preponderance of one or another set; as in the flexion of the fingers during sleep.

After death, for a certain time the muscles will contract under the excitation of galvanic electricity. The signal of the loss of this irritability is the coming on of *rigor mortis*, the stiffening of death. This is not a vital contraction at all, but rather a physical change, the first result of the death of the muscle. After it follow relaxation and decomposition.

Rigor mortis may begin at any time from ten minutes to six or seven hours after death; usually it is an hour or two at least. Sudden death from violence in full health is followed by *late* rigidity, continued long. After protracted exhausting disease, it is apt to occur soon and to be short in duration. Death by lightning has been observed to be without any rigor mortis.

This stiffening affects the involuntary as well as the voluntary muscles. It begins in the left ventricle, and ends in the right auricle; the other muscular organs, including the arteries, contracting between these extremes in time.

Classifying the muscles of the body according to their method of action, they may be designated as *voluntary*, *involuntary*, and *mixed*. Purely voluntary are all the muscles of the surface of the trunk and of the extremities.

Voluntary Muscles.

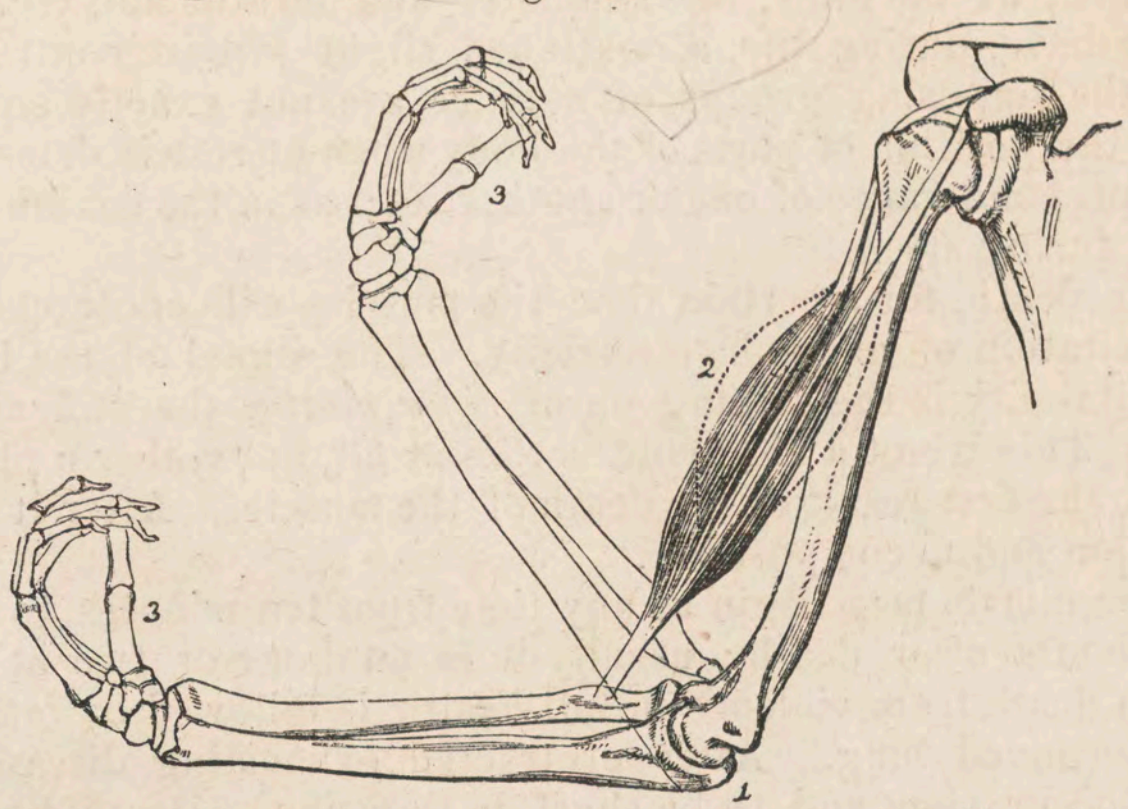
The action of these, by their tendinous attachments, is, in most cases, upon the bones. These, as mechanical instruments of locomotion, may be divided into levers of the *first*, *second*, and *third* kinds. In the first, the *fulcrum* or fixed point is between the power applied and the weight or resistance. In the second, the *weight* or resistance is between the power and the fulcrum. In the third, the *power* is applied between the fulcrum and the weight or resistance.

Of the first kind of lever, an example is the movement forward, or backward, of the head upon the spine, by the muscles of the front or back of the neck.

Of the second kind, an instance is, raising the body upon the toes, by the action of the muscles of the calf of the leg.

Of the third kind, the action of the *biceps flexor cubiti* is the best example. In this, the power is applied at the insertion of the biceps tendon into the radius, below the elbow; the fulcrum is at the elbow-joint, and the weight is that of the forearm and hand.

Fig. 138.



THE BICEPS MUSCLE.—1. The fulcrum. 2. The power. 3, 3. The weight.

This muscle affords an illustration of the fact that some muscles are arranged at a less advantage of *power* than might be given by a different insertion. If the biceps were inserted at the wrist, it would lift ten times as much. But, then, inconvenience in bulk and loss of beauty and grace would follow. The law of mechanics also applies, that what is gained in power is lost in velocity, and *vice versâ*.

Pulleys for special direction of muscular action exist in several parts of the body; as in the course of the *superior oblique* muscle of the eye, the *digastric* of the neck and lower jaw, etc.

The amount of effort made by the muscles is perceived by what is called the *muscular sense*. Its employment is exemplified in *weighing* anything in the hand, in balancing one's self (à la Blondin) on a tight rope, and in skating. The latter exercise is guided almost entirely by the muscular sense.

Involuntary muscular action has been considered sufficiently, in connection with the organs of nutrition, secretion, &c., whose functions it subserves.

Universal law of contractile or alternating motion — waves! Brownian motion Cyclosis — Zoospores!

Motion in animals (& plants)

amoeba (white corpuscles) —

Ciliated —

Most active — Articulated

Least — Mollusca —

Serpents! Ovary.

Among vertebrates — Rept. little — fishes also —

Birds most — (hot blood) — & carnivorous mammals —

1. Striated — 2. Non-striated fibre

(3. Contractile fibre-cell)

Garrod —

Diff. of temp. betw

interior & exterior of body

Nifty improbable —

A Flint Jr.'s observations on

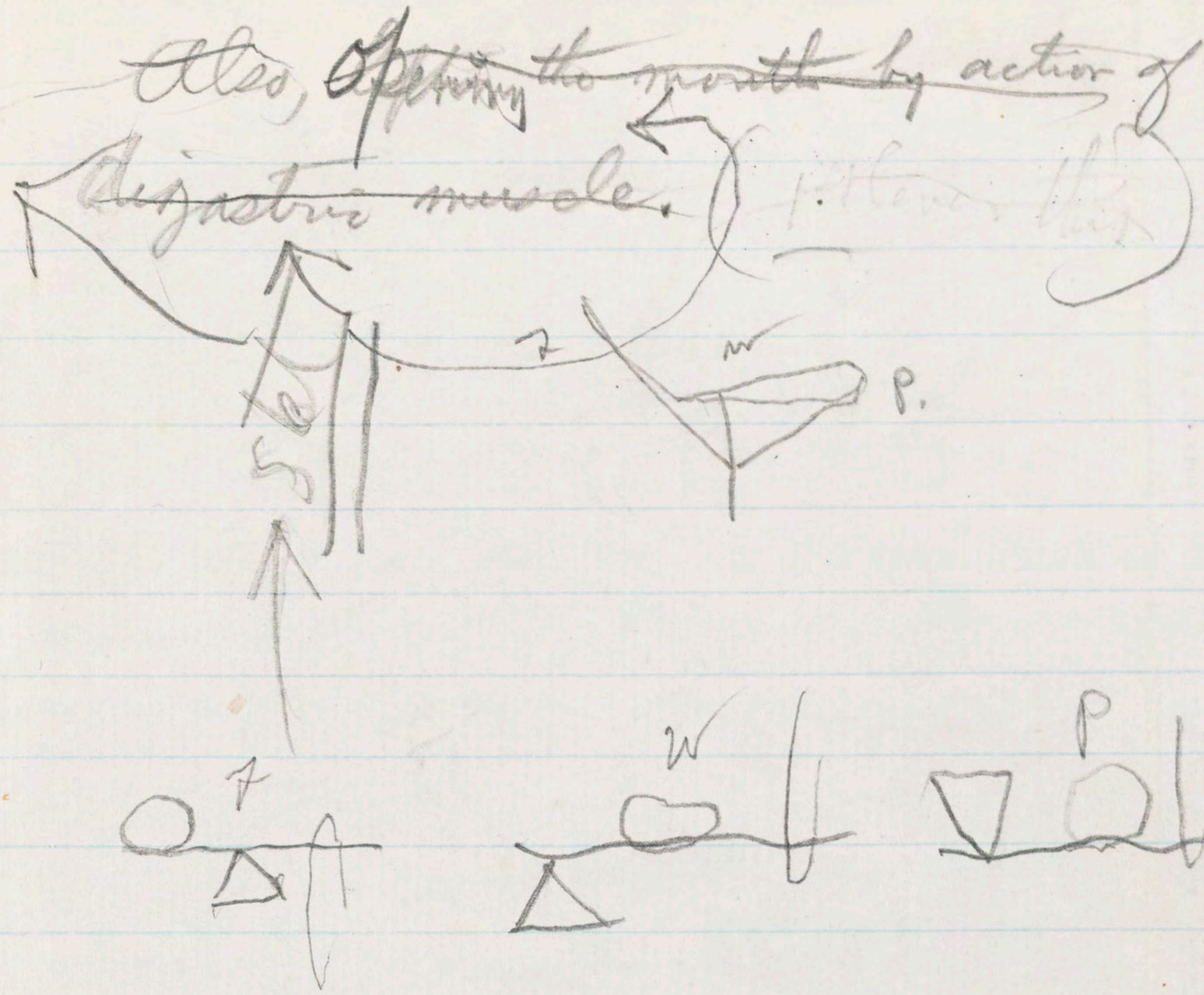
Weston - walks 100 miles in 22 hours.

(Sick Workmen not other operations)

Perhaps it depends on coagulas of interfibrillary juice. Or, loss of electric tension? (Radcliffe).
By injection of arterial blood, Brown Séquard found rigor put off, galvanic irritability continuing.

Heat Stroke.

Also, opening the mouth by action of digastric muscle.

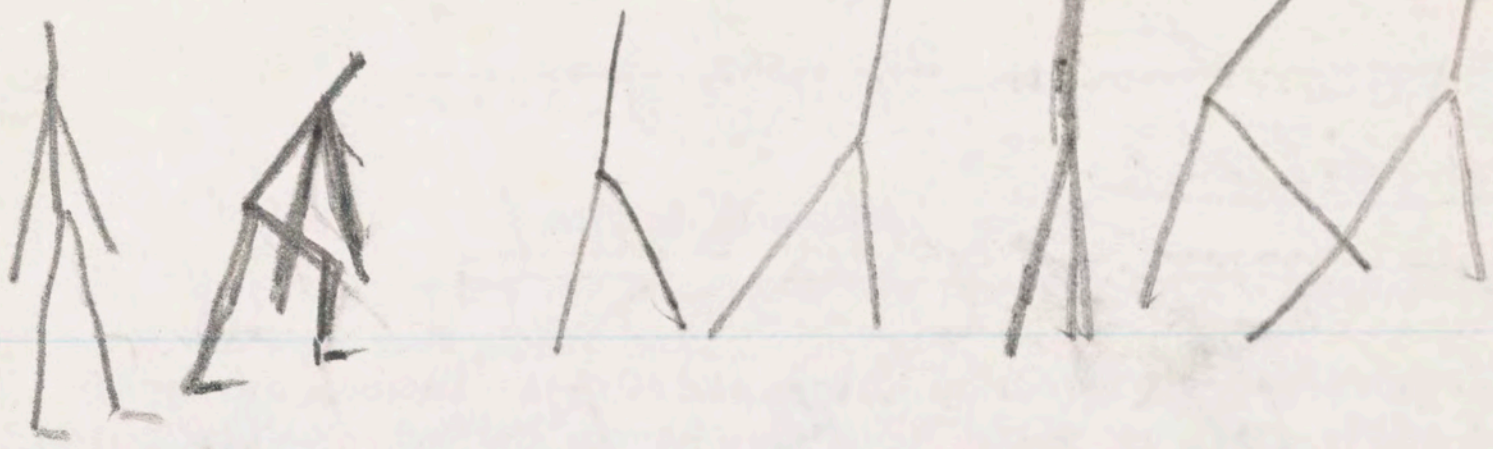


"Toggle joint" action

Walking

to

Running.



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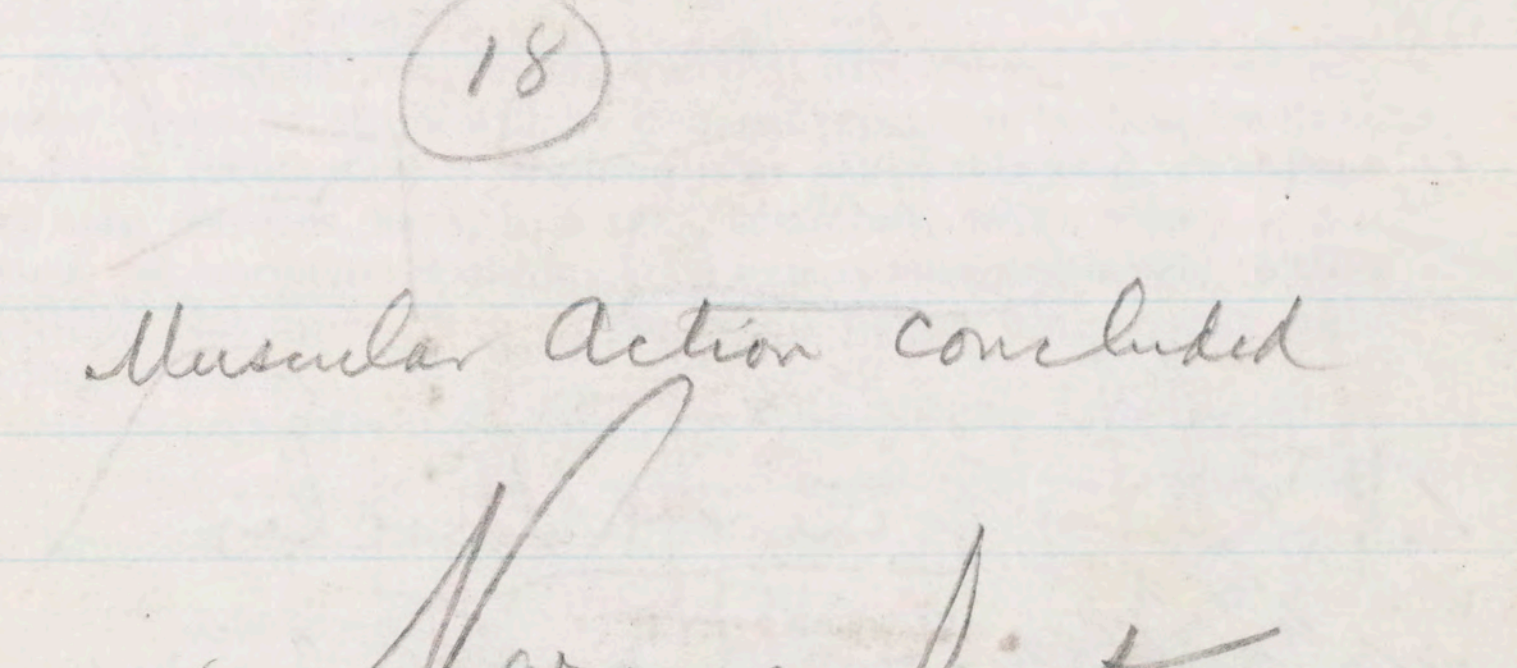
(18)

Muscular Action concluded

Nervous System



Locomotion in animals generally:

amoboid & ciliated.

creeping. — swimming. — walking — climbing — flying.

worm — caterpillars — serpent — leech — Spirit of power

Nautilus — fish — whale — Cliopoda — Lobster —

horse — deer — elephant — camel — bear — cat — ape — man —

woodpecker — Parrot — sloth — Monkey — Treefrog — Gecko

insect — fly — squirrel — galeopithecus — bat — bird — man's maver — flyfish — fly dragon

Mechanism of Walking & running.

Hygiene of Muscles & Bones.

1. Laws of Nutrition — Repose

Most amenable most useful

Walking — Skating. — Riding on horseback — Health lift — Rowing —

"cumulative exercise";

Calisthenics — Strength & grace.

Sewing machine (versus needle-work)

Myalgia

2. 1 day's rest in 7 a physiological need.

3. Hard parts governed by soft parts in growth.

Crooked spines

Clateral deformity

Stationary Calisthenics.

Mixed Muscles.

Of this character are the muscles of the pharynx, of the respiratory apparatus, and of the face.

When we *swallow*, the will has control only over the beginning of the process; after the morsel gets fairly within the grasp of the constrictor muscles, its descent cannot be arrested.

Breathing is ordinarily involuntary, continuing during sleep. But we have the power to hold the breath for some seconds, as well as to modulate it for vocal utterance.

The muscles of *expression*, in the face, though yielding readily to volition, are most naturally controlled by *emotion*. Strong feeling involuntarily exhibits itself in the countenance. Efforts at the expression, by the face, of counterfeit emotion, when no feeling exists, seldom are successful. Actors and orators personate and convey emotion best, by throwing themselves for the time into the character or feeling required; so that it then expresses itself, naturally and effectively.

Many muscular movements which at first are performed entirely under direction of the will, by frequent repetition become habitual, and then involuntary. Walking is an act of this kind. Soldiers, on long marches, have, it is said, sometimes fallen asleep on the road, yet continued marching. An expert musician is said to have finished playing a piece on the piano, begun while awake, after going to sleep.

CHAPTER VII.

FUNCTIONS OF THE NERVOUS SYSTEM.

GENERAL CONSIDERATIONS.

THE purpose of the nervous apparatus, still more constantly than that of the muscular system, is to maintain *relations* and *communications* between the body and things external to it, and between its own different parts.

The ultimate formative elements of the nervous system are, 1, *nerve cells*, collected into *ganglia* or *nerve-centres;* and 2, *tubular nerve-filaments*, arranged in bundles called nerves and commissures. The centres are like the stations or offices of a telegraphic system; the nerves correspond with the wires. The simplest conceivable nervous system consists of one ganglion with two nerves; one of these conveying impressions from the surface to the ganglionic centre, and

the other taking out impressions from that centre to a movable tissue. The first of these nerves is called an *afferent*, and the second an *efferent* nerve. Action produced by such a conveyance and *reflection* of an impression by a nerve centre is called *excito-motor* or *reflex* action.

Ganglia are said to receive, accumulate, generate, reflect, and radiate nerve-force. Most certain is the fact of their *reflection* of

Fig. 139.

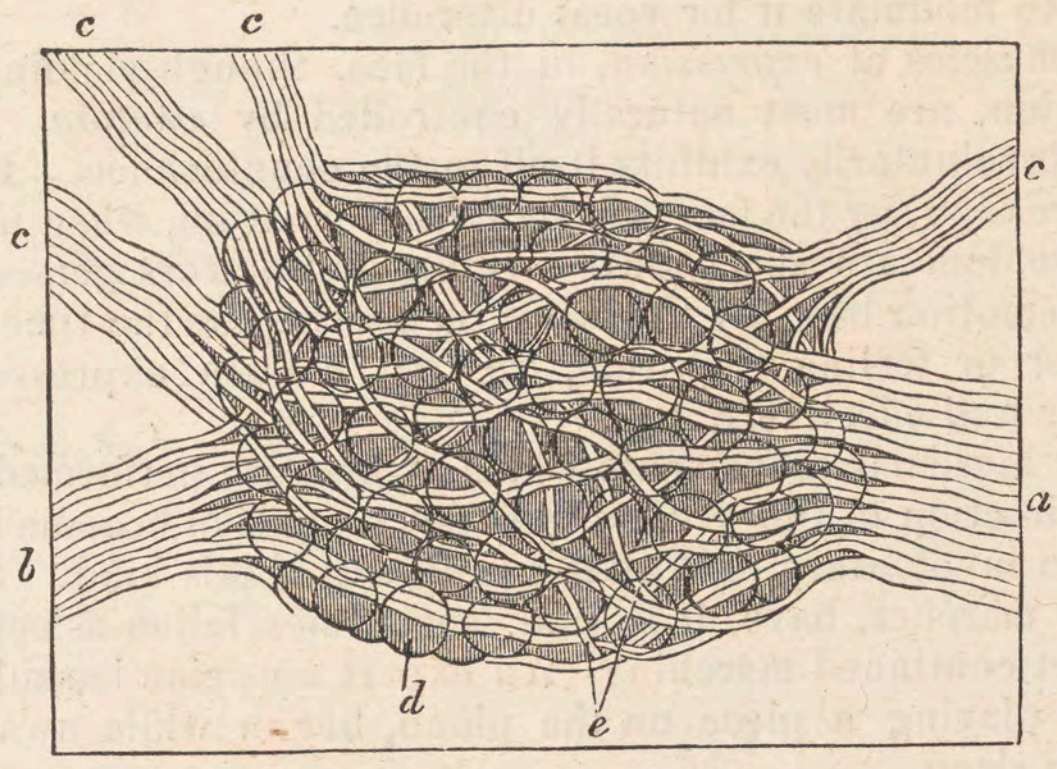


Diagram of a Ganglion. *a*, *b*, *c*. Nerves. *d*, *e*. Cells.

its impressions; the understanding of which is the key to the functions of nervous organs, from the lowest to the highest. *Radiation* of impressions appears to occur sometimes, as when disease in one tooth causes pain in the whole of that side of the face; or when inflammation of the hip-joint (coxalgia) brings on pain extending to the knee.

Nerves only transmit impressions. Their analogy to wires of the telegraph is close; we do not understand that anything "flows" along them, the term *current* being metaphorical; but, that a *wave* of *movement* of their particles is propagated along them, from end to end. Certain constant facts or laws of nervous transmission are important.

1. Every nerve transmits impressions *only in one direction;* either toward (afferent) or from (efferent) a centre. All afferent nerves are not sensory. Reflex action may occur without sensation. The latter only exists when an impression is conveyed to the *brain*, the seat of the perception of sensations.

There is clear proof that muscular movement may take place without sensibility of the parts concerned. Thus, in the experiment of Brown-Séquard and others, of dividing the spinal marrow of a frog in sunder; if a hind foot of the animal be then pinched,

Nervous Systems of Animals.

Protozoa — none discoverable.

Radiata — Circular chain of ganglia around the mouth.

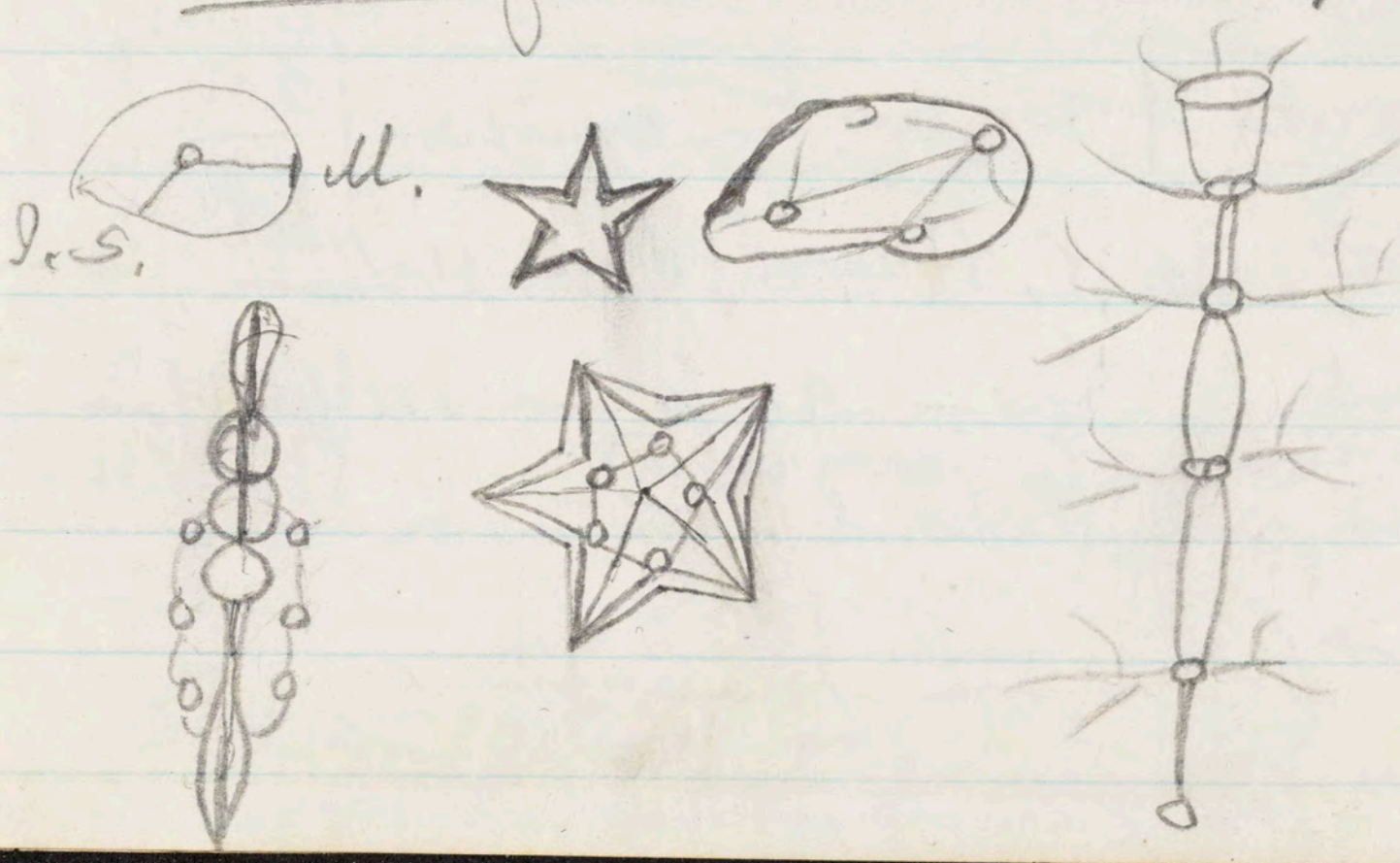
Molluscoa — one or several ganglia
Commonly unsymmetrical.

Articulata — Double, elongated chain of ganglia.

Vertebrata — 1. Cerebro-spinal
2. Ganglionic.

Except Amphioxus.

Idea of a Telegraphic System.



The term trophic nerves is sometimes applied to nerves supposed to exercise immediate control over nutrition. Almost certainly, such filaments belong to the ganglionic or sympathetic system.

Deaf-mute may learn to speak by sight — watching lips of a speaker.

Velocity of nervous transmission, — Helmholtz, Baxt, Hirsch, Von Wittich, Rutherford & others — 90 ft — 111 feet — 160 feet in a second. 160 feet (sensory nerves)

(See next blank page)

PHILADELPHIA
MEDICAL TIMES.

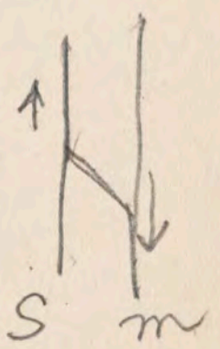
PHILADELPHIA, JANUARY 8, 1876.

EDITORIAL.

NERVES AS CONDUCTORS.

A PROBLEM which is very interesting from a scientific if not from the so-called practical point of view is that which is expressed in the question, In what way do nerves transmit impulses? The hypothesis which has found most favor during the last few years is that of Brown-Séquard. This justly famous physiologist conceives that there is a special conductor for every special impression or form of nerve-recognition of an external agent: so that every complete nerve contains within itself at least eleven kinds of fibres, viz., conductors of impressions of touch, of tickling, of pain, of temperature, of muscular contraction, incito-motor conductors, incito-nutritive and secretory conductors, voluntary motor conductors, involuntary motor conductors, vaso-motor conductors, nutritive and secretory conductors. To these must be added four different nerve-fibres of the higher senses. Not content even with this complexity, Brown-Séquard writes, "I need hardly say that the number of functionally distinct nerve-fibres is probably much greater." In this assertion he is of course correct if his dominant idea be true, for in his list is found no room whatever for inhibitory nerves.

Space is wanting to enumerate the arguments brought forward by Brown-Séquard in favor of his conclusions. They may be plausible, but they certainly are not demonstrative; and the extreme complexity of such a system seems at variance with the usual physiological laws. Further, the known facts in regard to the union of divided nerves appear to be irreconcilable with this view of distinct fibres. More than thirty years ago, Flourens proved by experiments upon the lower animals that mixed nerves, when divided, will unite and recover their function if the end of the peripheral portion of one be brought in contact with that of the central part of the other; and surgeons to-day know full well that an ordinary nerve containing all sorts of fibres will unite perfectly after section. It is, to use a very mild term, in the highest degree improbable that the divided ends of individual nerve-fibres can seek out one another, or even that the eleven different sorts of fibres shall find their own kind. Further, the experiments of Vulpian and Phillipeaux seem to give the *coup-de-grâce* to the speculations of Brown-Séquard. They proved that a motor nerve may be made to unite physiologically as well as anatomically with a sensory nerve, an irritation of the motor nerve *above* the point of union giving rise to motion in the tributary muscles, and an irritation of the sensory nerve *below* the point of union producing pain.



Similar experiments have, it is true, failed in the hands of some other physiologists to give a similar result, but the positive results obtained by Vulpian and his colleague are hardly to be considered disproved by the negative results of other observers.

For the reasons just assigned, the theory of Brown-Séquard has never seemed satisfactory; but we confess to being greatly pleased by a new one by Dr. Robert McDonnell.* Its simplicity is as striking as is the complexity of the older view. Moreover, it is seemingly in accord with the accepted views of forces and their mode of action in the outer world, and brings nerve-force into a direct correlation with these outer influences. The theory is stated with sufficient fulness and clearness in the following passage, which we extract entire from the work of its author:

* Lectures and Essays, part ii. p. 220, Dublin, Fannin & Co., 1875.

inflammatory symptoms have disappeared or have notably diminished, Rollet recommends the following injection :

℞ Liquor. plumb. subacetat,, f℥i ;
Zinci sulphat., gr. vj ;
Vini opii, f℥ss ;
Aquæ dest., f℥vj.
M. et ft. sol.
Use from three to five times daily.

As an enema in cases of painful erections and chordee, Ricord advises the use of the following mixture in conjunction with emollient and diuretic drinks and prolonged baths :

℞ Pulv. camphoræ, gr. viii ;
Extract. opii, gr. ss ;
Vitell. ovi, i ;
Decoct. lini, f℥i.—M.

J. W. W.

COLLODION FOR USE IN FRECKLES (*Bulletin Général de Thérapeutique*, October 30, 1875).—A solution of corrosive sublimate either pure or mixed with cyanide of mercury is commonly employed for the removal of freckles ; but a collodion containing ten per cent. of its weight of sulpho-carbolate of zinc has given excellent results without being accompanied by any of the dangers attending the use of the mercurial solution. The following formula is an excellent one :

Sulpho-carbolate of zinc, 1 part ;
Collodion, 45 parts ;
Oil of lemon, 1 part ;
Absolute alcohol, 5 parts.

The sulpho-carbolate of zinc should be reduced to an extremely fine powder, and should then be thoroughly incorporated with the fluid mixture. J. W. W.

OUTWARD LUXATIONS OF THE HEAD OF THE RADIUS, AND THEIR TREATMENT (*Bulletin Général de Thérapeutique*, October 30, 1875).—Dr. Boularan has carefully studied the outward luxations of the superior extremity of the radius, which are very rare, occurring, however, more frequently in infancy and childhood than later. In the large majority of cases this dislocation is produced by a fall upon the elbow. The displacement cannot be complete without a rupture of the lateral, external, and annular ligaments.

The functional symptoms are not markedly characteristic, but may be variable. Reduction will be almost always easy, but retention is very difficult, and can only be secured by complete and long-continued immobility. In spite of this difficulty, the prognosis is never grave, as extension and flexion usually return almost completely ; generally, however, supination remains very limited. In all cases the restriction of movement diminishes with time, and some patients even regain the entire range of movement of the fore-arm. These facts are important in determining the prognosis of such cases. J. W. W.

NEW METHOD OF ARRESTING THE ACTION OF THE HEART OF THE FROG (*Centralblatt für die Med. Wissenschaften*, No. 44, 1875). —Tarchanoff (*Gaz. Méd.*, 1875, No. 151) states that if a knuckle of the intestine together with the mesentery belonging to it be drawn from the abdomen through a wound of the parietes of that cavity, and allowed by exposure to the air to become inflamed, the slightest movement of the inflamed portion will cause a cessation of the heart's action. The experiment will not succeed if made before inflammation has occurred, if the vagus is cut, or if the frog is under the influence of woorara.

W. A.

RESULTS FOLLOWING VARIOUS MODES OF TREATMENT OF DIPHTHERITIS (*Berliner Klin. Wochenschrift*, No. 40, 1875 ; by Dr. Theodor Schüler.)—These results are drawn from the observation of seventy-nine cases which were treated by Dr. S., forty-one of which were treated with chlorate of potassium, with six deaths, twenty-three with carbolic acid, with one death, and fifteen with salicylic acid, with seven deaths ; lime-water being also energetically used in all. The patients varied in age from seven months to thirty years.

From these observations Dr. S. concludes that salicylic acid has at least no better effects than the other two remedies used, and, so far as his own practice is concerned, carbolic acid has more to recommend its use than salicylic. W. A.

THE TREATMENT OF LEUKÆMIA (*Centralblatt für die Med. Wissenschaften*, No. 42, 1875).—Dr. Ordenstein thinks that hereditary syphilis may play an important rôle among the causes of leukæmia, and has treated one case of the splenic form of this affection, in which the father of the patient had syphilis, with anti-syphilitic remedies with good results. Other modes of treatment had been tried with no good results, but the administration of Van Lincten's solution during several months was followed by the most surprising success.

W. A.

"I conceive that the various peripheral expansions of sensitive nerves take up undulations or vibrations and convert them into waves capable of being propagated along nervous tissue. Thus the same nerve-tubule may be able to transmit along it vibrations differing in character, and hence giving rise to different sensations; and, consequently, the same nerve-tubule may, in its normal condition, transmit the wave which produces the idea of simple contact, or that which produces the idea of heat; or, again, the same nerve-tubules in the optic nerve which propagate the undulations of red may also propagate, in normal vision, those which excite the idea of yellow or blue; and so for the other senses."

Prevention.—The accoucheur who supports the perineum the most will be found to have the largest number of ruptures in his practice; and next to him the one who does not support it at all; so that here, as in so many other cases, extremes meet. By supporting the perineum too long and constantly, we interfere with its physiological softening and distention. We read in Ramsbotham of a case where that distinguished obstetrician supported the perineum for eight hours continuously. It is not recorded whether the perineum was ruptured finally or not, but it certainly ought to have been under the circumstances. The true secret of success in conducting this part of labor is to really support the head and not the perineum. We ought to keep the head strongly flexed by pressure with the hand; also, forcibly preventing its too rapid delivery, and by no means permitting extension to take place

the limb will be jerked with force; although it is certain that no sensation can be conveyed to the brain. John Hunter saw a paraplegic patient, quite deprived of feeling in his feet; yet tickling the sole of one of them caused the limb to be withdrawn. This was *involuntary, automatic*, reflex or excito-motor action.

2. Each nerve can convey only *one kind* of impression. *Efferent* nerves may be nerves of *motion*, if they are distributed to muscles; or, the excitation they bear out will cause *secretion*, if they terminate in glandular organs. This, when it results from an impression reflected by a ganglion which receives it from an impressible (exterior or interior) surface, is *excito-secretory* action. So, the presence of food in the mouth excites the salivary glands to secretion; in the stomach, it draws out the secretion of the gastric juice; &c. Morbidly, we find the irritation of the gums in the dentition of weakly children inducing diarrhœa, from excessive excito-secretory action. This is parallel to the violent morbid *excito-motor* action, denominated *convulsions*, which incomplete dentition may cause, through irritation of the spinal marrow; and which may also be brought on, in like-manner, by the presence of indigestible food in the stomach or intestines, or accumulated feces in the rectum.

Nerves of *sensation* are capable, each, of only one kind of sensibility. Some are nerves of *touch*, one of *sight*, another of *hearing*, *taste*, or *smell;* no one of *more* than one of these. If the optic nerve is irritated, a flash of light, not pain, results. Irritation of the auditory nerve or its sensorial centre will cause a "subjective" impression of sound: as, for example, the "tinnitus aurium" produced by quinine in large doses. Substitution of the guidance of one sense by that of another may occur, as when a blind person walks by direction of his hearing and touch. But the actual transfer of one kind of special sensibility to a nerve possessed naturally of another function, is impossible.

3. Sensory nerves usually report, so to speak, their impressions as if coming from their terminations; even when it is the trunk of the nerve that is acted upon. What is commonly called the *crazy-bone* at the elbow is the ulnar nerve; when it is struck, the principal pain is not at the elbow, but in the last two fingers, to which its terminations are distributed. After the amputation of a limb, sometimes sensations in the stump seem to the patient to be in the missing toes. A flap of skin being brought over the nose to replace a deficiency of the latter, for a few days a fly lighting on the nose will produce an itching, referred in the individual's feeling to his forehead.

Nerve-filaments never inosculate (*i. e.*, actually join into one, as bloodvessels do), although they are often packed together in the same trunk, called "a nerve." When such a trunk is divided, intentionally or by accident, it is slow to unite again. In course

of time it will do so, however; and then the function of its filaments may be, though it is not always, entirely restored. This is remarkable, since a trunk, containing a number of filaments, some motor, some sensory, and others ganglionic or sympathetic, must, when divided, suffer displacement of their corresponding ends. Each filament must, therefore, be restored to its proper connection, notwithstanding the displacement; as though function had a sort of control over nutrition.

Nothing in the appearance or structure of any nerve shows a reason for its character, *i. e.*, whether it be sensory or motor, etc. This would seem to be determined by the connections of its extremities. Dr. Beale believes that no nerves have free ends; but that each filament makes a complete circuit.

The nature of nerve-force has been the subject of much speculation. The favorite hypothesis with many has been, that it was identical with electricity. Galvanism will, undoubtedly, *stimulate* the muscles and other organs through the nerves of a living or recently dead animal. But so also will the point of a knife, high heat, a drop of nitric acid, etc. Electricity is only one of the stimulants which call out, as it were, nerve-force. Moreover, Matteucci has shown that no special electrical current passes through even the largest nerve of the limb of a horse, when the muscles are stimulated to action. If a nerve be cut across, and the ends be placed in contact, or with a copper wire between them, or if a ligature be drawn tightly around it, in either case electricity will traverse it freely, but nerve-impressions will not. Muscle is a decidedly better conductor of electricity than nerve; and copper wire is many million times a better conductor than either. Still, electrical currents are proved to be constantly present in different parts of the living body. Among the conversions or transmutations of force (modes of motion) taking place, it is quite probable that the generation of electricity may have a place, not as yet clearly defined. This is rendered the more probable by the fact that several species of fish, as the *torpedo*, *gymnotus*, and *silurus*, have special electrical organs or batteries, directly connected in each with the nervous system.

REFLEX ACTION.

This is the key to the whole physiology of the nervous system. Although before discerned by Unzer and other physiologists, to Marshall Hall belongs the credit of developing our knowledge especially of the reflex functions of the spinal marrow. Laycock, Carpenter, and others have extended the study of reflex action to the physiology of the brain and of mental action; Longet and Campbell, into that of the secreting organs. The simplest and most common of reflex actions, in all the subdivisions of the animal

Helmholtz (1854) showed
time for passage of impression from
sensory to motor root of nerve in frog.
Cord $\frac{1}{30}$ to $\frac{1}{10}$ second; being
12 times as long as passage
along sensory & motor nerves.

$\frac{1}{360}$ to $\frac{1}{120}$ Personal "equation" error of

Car conductors & drivers —
be

Painful impression always
travel more slowly than
tactile ones

Lord

Nerve-irritability may be (by woorara or curara) destroyed without affecting that of the muscles.

Either will be exhausted by long-continued, often repeated, or excessively violent excitation

Over

T. C. Mendenhall of Columbus Ohio (Am. Journal of Sci. & Arts, Sept. 1877) by simple registering apparat., find response to appearance of a white card made by muscular action in .292 Sec.; electric spark in dark, .203; Sound, .138; touch on forehead, .107; hand, .117; deciding between white & red card, .443; " circle triangle, .494; " tones C & E, .335 " " C & C' (ultra) .428

Doubtless rather quicker.

See Nature - last nos. 1873

Exner - similar results.

Examples

Protozoa — No nervous system — (Infusoria, Sponges, Foraminifera — Rhizopods)

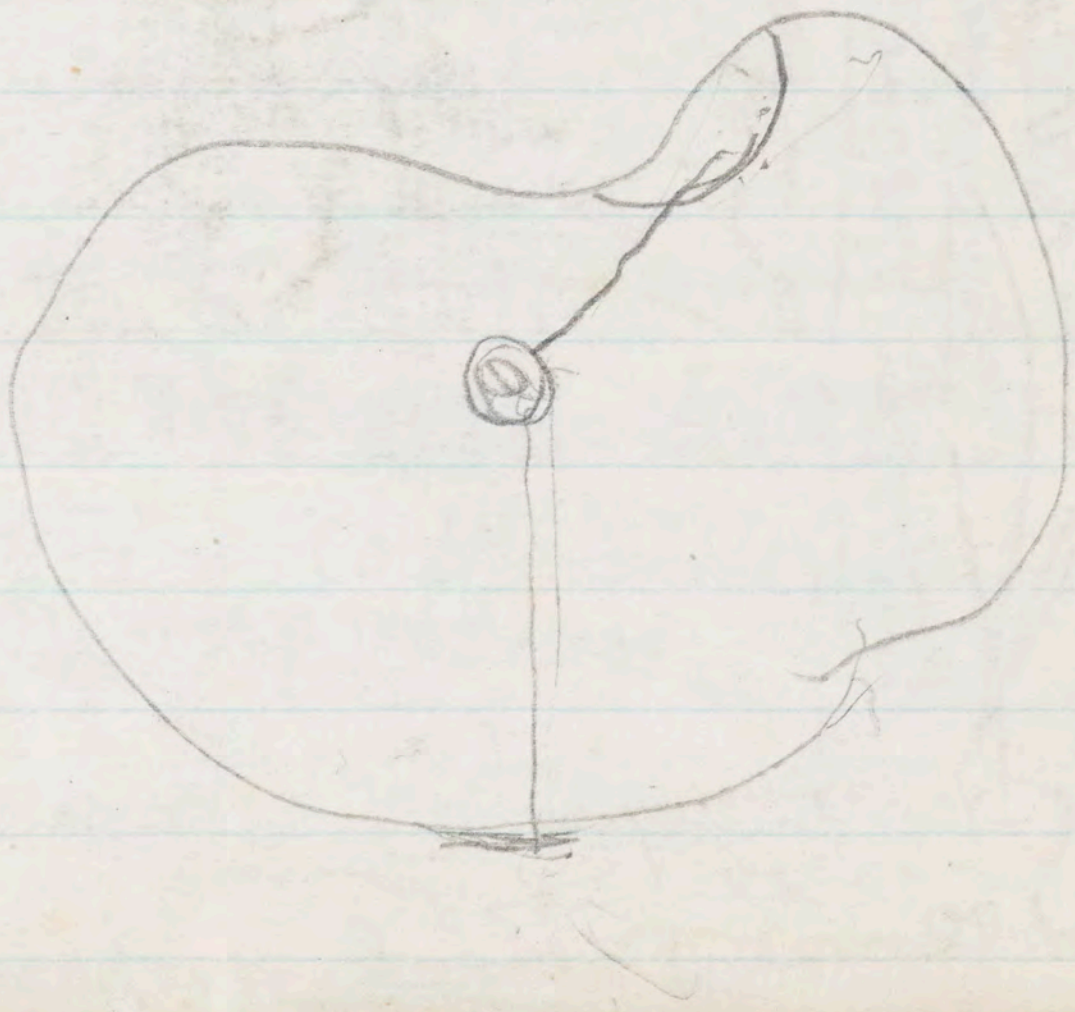
Coelenterata — 1 ganglion, if any — (Hydras, Jellyfishes; Sea anemones, Corals)

Annulata — From 1 to 5 ganglia — radiate type (Parasitic worms & starfishes)

Annulosa — Double cord 9 ganglia — (Worms, Insects, Crustaceans; Spiders & Lobsters & crabs)

Molluscoida — one oral ganglion — (Asidians, Brachiopods, Polyzoa)

Mollusca — 3 ganglia typically, — oral, pedal, & parietosplanchnic — or cephalic — (Oysters, Snail, Cuttlefish)



a sort of nerve-plate, something in muscles a

Kölliker, free ends in muscles,

Gangli cells at periph. ends, in eye & ear — & perhaps some other parts

The Neuroglia is a fine retiform, peculiar semi-connective material, interpenetrating the ganglia & nerves, giving coherence and support to them all.

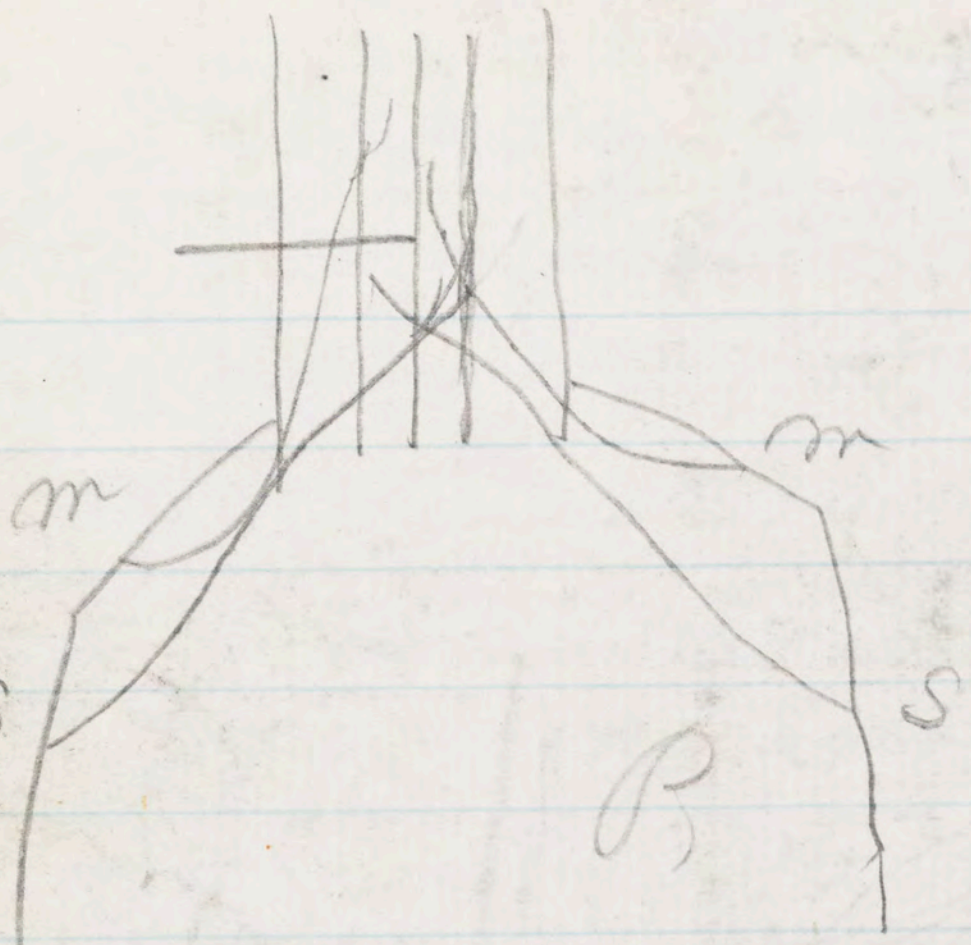
1. Plexuses skin - 2, Tactile Corpuscles; finger tips
3. Terminal bulbs – tongue papilla

The current may be used in the muscular action.

Motion through sensory nerves quicker than through motor.
Motor impulses quicker through sp. cord also.

Rate of movement through a nerve determined by the difference in time of response according to the length of the nerve involved.

See next blank p. opposite p. 272

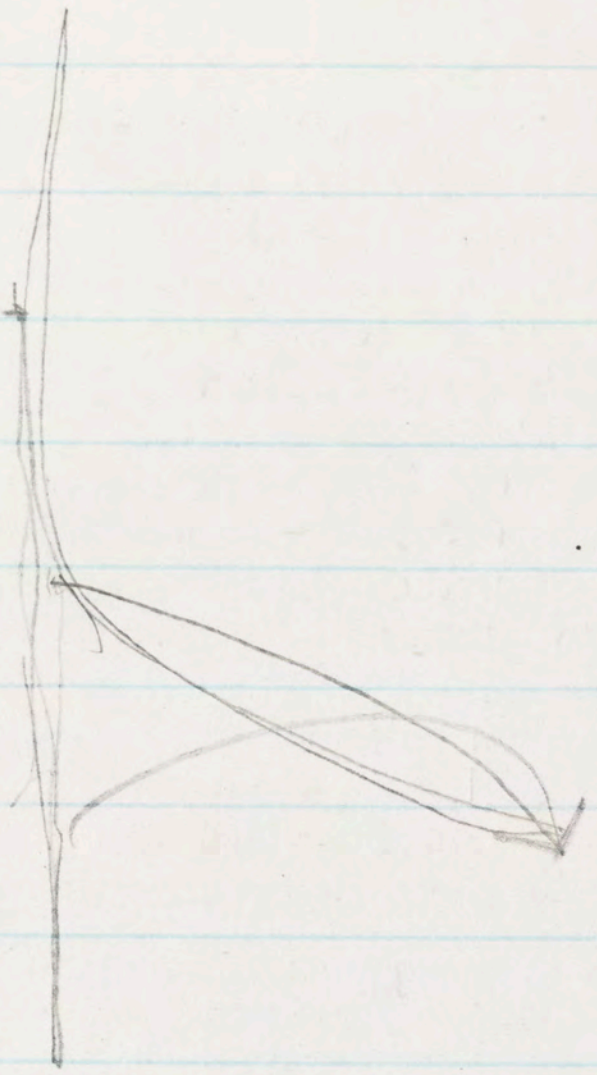


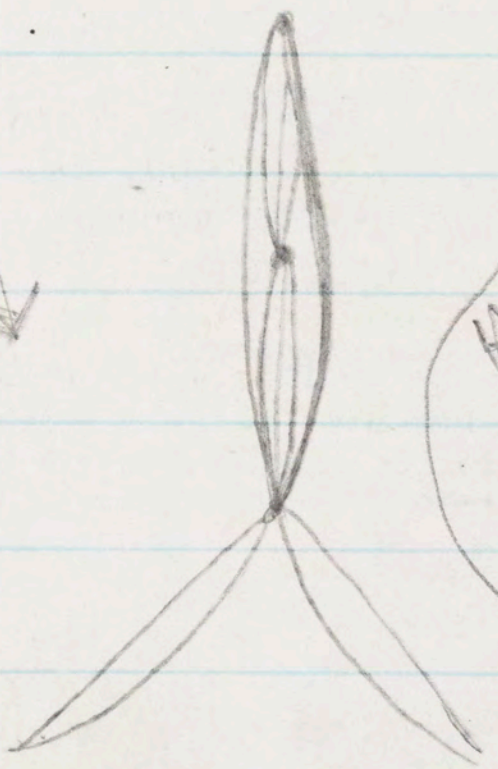
19

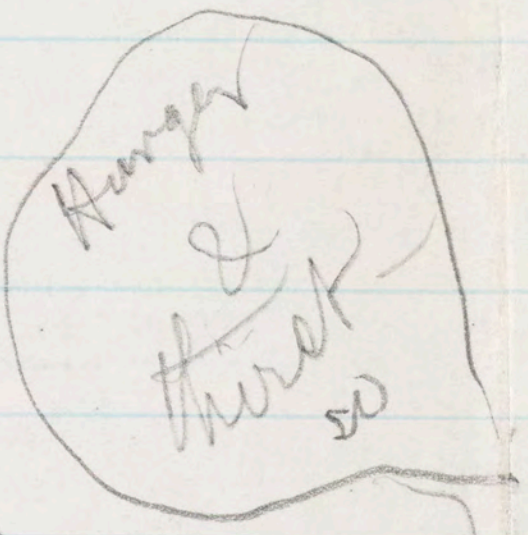
Reflex actions –

Ganglionic System

Spinal Cord







4

* Reflex action of arteries →

1. stimulates contract →

2. ~~Spread~~ dilatation →

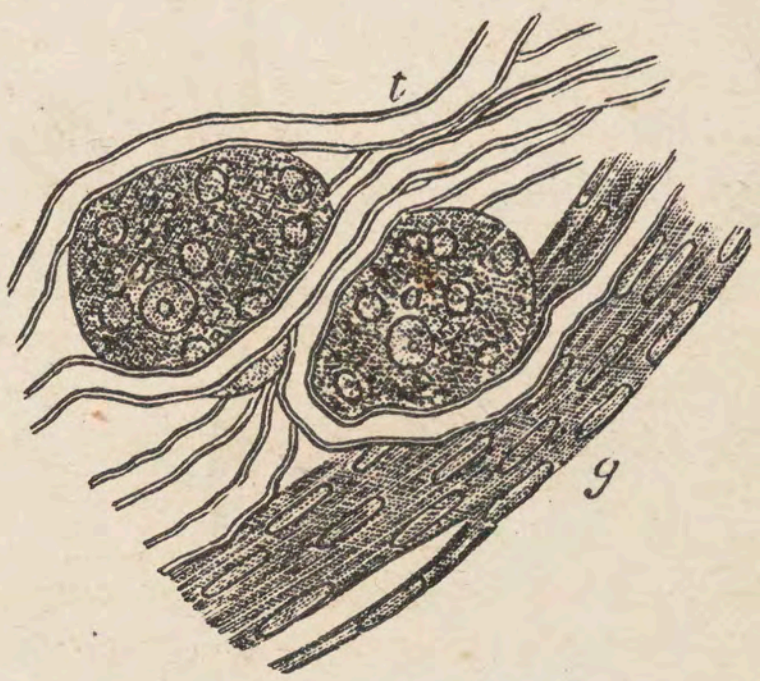
3. paralysis dilatation →

kingdom, is *excito-motor* action. Next, is *excito-secretory* action. We may add, after Carpenter, *sensori-motor* and *ideo-motor* actions. Besides, also, the *voluntary* motor actions, wherein will directs the choice between different possible actions of the reflex system, it would be equally correct to speak of *emoto-motor* actions; in which, not volition, but emotion gives character to the effective impulse.

Excito-motor actions are those in which an impression upon a receptive surface (interior or exterior) is, by an afferent nerve, conveyed to a motor nerve-centre, and, thence, reflected through an efferent (motor) nerve to a muscle, which it brings into action. Thus, in a complex animal, movements are effected by stimuli at a distance from the muscles, which could not, without inconvenience, be made to reach them directly. In this way the nerves and nerve-centres are *internuncial*, in the body itself.

Familiar acts give clear examples of such reflex agency. The pupil of the eye contracts when strong light falls upon the retina; this is because the impression is conveyed to a ganglionic centre, and thence reflected through a nerve to the circular muscular fibres of the iris. The impression of the want of oxygen in the blood is conveyed (chiefly from the lungs by the pneumogastric nerve) to the medulla oblongata; thence it is reflected, as a motor impulse, to the diaphragm and intercostal muscles, for inspiration. A morsel of food is introduced into the pharynx; the impression made by it upon the mucous membrane is carried by the glosso-pharyngeal nerve to a part of the medulla oblongata, whence it is reflected to the constrictor muscles of the pharynx which act in deglutition. A similar account might, of course, be given of defecation, parturition, &c.

Fig. 140.



GANGLION-CELLS.

Excito-motor actions under *morbid* irritation are seen in convulsions, lock-jaw (trismus, tetanus), and, with less violence, in coughing, sneezing, vomiting. Such movements are usually involuntary, and often not controllable by the will. *Extreme* reflex excitability is met with especially in infancy (most of all during dentition), and in *hysteria* and *hydrophobia*.

GANGLIONIC NERVOUS APPARATUS.

In *Anatomy*, this is commonly described as "the Sympathetic Nerve." All the ganglia upon the spinal column and in the cavities and internal organs of the body, have two sets of communications: 1, with the spinal cord; 2, with the organs of circulation, digestion, assimilation, secretion, or reproduction.

Fig. 141.

JUNCTION OF SPINAL AND SYMPATHETIC SYSTEMS.—*a*. Anterior root of spinal nerve. *p*. Posterior root. *c*. Columns of spinal cord. *s*. Sympathetic. *a'*. Spinal nerve. *e*. Connecting filaments.

Whether any motor or other power belongs to or originates in the ganglia, or whether all their energy is derived from the spinal marrow, is a question. At all events they exercise a modifying, regulating influence over the functions of the organs to which, in many parts, they alone send nerves. This is the case with the arteries, intestines, glands and their ducts, &c. Bernard and others have shown, for instance, that division of the sympathetic nerve in the neck causes passive dilatation of the bloodvessels, with redness and heat.

Paul Bert showed by elaborate independent ex-
periments, that all feeble (galvanic) excitants
of centripetal nerves accel. respiratory movements
all prompt excitants darkens them."

Bert does not admit Rosenthal's view, that
the Resp. Centres is antagonistic to vagus Resp.

See under this.

Take from [illegible], laudanum & water (1 part in 3 or 8) & gargle in sore throat [illegible]

& rubbing in phthisis &c

Ether (Heberden) solvent of biliary calculi—
abundance of water, ditto, in obstructive jaundice.
Cod liver oil in diab. mellitus. (oil-rubbing too?)

Inhibition .....

(Nuel, of Utrecht, found the effect of artificial stimulation of the vagus different in the auricles & the ventricles; also, he asserts ~~that~~ "the nerve contains some fibres which excite instead of retarding the heart's movements." Bulletin de l'Acad. Roy. de Belgique, 1873, nos. 9 & 10.

"A powerful impression may impair vitality without (reflex) action; 2 effects thus:— one stimulating to action,— the other destructive of life."

Pain — "toward death" Radcliffe.
— exterior, or morbid —
Protective.

Degree of an impression often important,
1. stimulant — 2 inhibitory — 3. paralyzing.
See Stirling, Journ. of Anat. & Phys. Jan. 1876.

How far an impression goes,
in some instances, may determine its character.

Beginning at the surface (ext. or int.), if it reach only to a Symp. gangl., only secretory, contractive or smooth muscular action may follow. If further, to a portion of Sp. cord, — reflex striated muscle movement; still on to brain, sensori- or emotio-motor, or volitional.

Ganglionic or sympathetic system in disease.

Cholera — a ganglionic tetanus: e. g., —

Cholera infantum: ~~general~~ nutritive disorder, — digestive & excito-secretory, from heat & bad atmosphere.

Ganglionic cachexia: [my case of "dyspepsia" '76 anæmia, &c]

Has not this part of the nervous apparatus much to do with blood-making?

Scrofula — rickets — marasmus & Exophthalmic goitre — Hysteria?

Leukæmia & Pseudoleukæmia & Progressive Pernicious anæmia.

In therapeutics; "arterial sedatives": Epsom salts! increase of tissue-change, by many salts (potass. iodid &c) retardation of tissue-metamorphosis

(Coffee) — by quinia, morphia, strychnia, (iron) as tonic in many cases; in phthisis; in gangl. cachexia.

℞ Quin. Sulphat, — Pil. Ferri Carb, — Ext. Nuc. vom.
gr. i — gr. ij vel iij — gr. 1/4

action on nerve-cells, of ganglionic syst.

of mercury — (generally stimulating secretions) increasing tissue-change, [so destroying syphil. deposits?] (capill. circulation &

& opium — generally diminishing secretion — & economizing nerve-irritation & tissue-waste.

Also, — of alcohol, — as in low fever, & debility especially subacute & chronic: (besides its stimulus to digestion)

Materia Medica and Therapeutics.

The Physiological Action of Jaborandi.

M. VULPIAN has some remarks to make (*Progrès Medical*) upon the dose which may be considered poisonous; he says he has many times injected an infusion of 10 or 12 grammes of the leaves into the veins of a dog, and only on one occasion did death result; in the fatal case post-mortem examination showed congestion of the gastro-intestinal tract, and of the brain and its membranes; there were also ecchymotic points in the lungs, especially under the pleuræ; he considers the lethal dose cannot be defined till the principle has been isolated. He proceeds next to consider its action on (*a*) the secretions; (*b*) the circulation; and (*c*) the iris.

Effects on Secreting Glands.—It increases the secretion of most; the salivary glands are first affected, next the lachrymals, then the glands of the skin and mucous surfaces, and finally, the liver, the pancreas, the mammæ, and the kidneys. The secretions poured out under the influence of jaborandi present the same physical and chemical characteristics as under ordinary conditions. M. Vulpian undertakes to throw some light upon the problem, how or by what means does jaborandi produce these hyper-secretions? and concludes that it is by its action in paralyzing the inhibitory influence of the terminal branches of the sympathetic system on the secreting cells, and bases this conclusion upon the following facts: Taking the submaxillary gland for his experiments, on account of its convenience and its known physiological relations, he reminds his hearers that excitation of the chorda tympani produces excessive secretion from this gland (Schiff), while faradization of the fibres of the sympathetic arrests the secretion thus provoked (Czermak); that sulphate of atropine abolishes the excito-secretory function of the chorda tympani (Keuchel), although the vessels dilate when it is excited, as usual, while on faradizing the upper end of the cut cervical sympathetic, the secretion flows anew (Heidenhain). If now, to a dog under the influence of curara, and poisoned by atropine, one administers by intravenous injection a large dose of the infusion of jaborandi leaves, not a single drop of saliva runs from the duct of Wharton. These facts prove that, although atropine does not abolish the secreting power of the gland-cells, jaborandi is not able to excite the secretion when the gland is under the influence of atropine; therefore it cannot be considered a direct excitant of the gland cells, but either an excitor of the chorda tympani, or a paralyzer of the sympathetic. To resolve this alternative, he refers to the action of jaborandi upon the sudoriparous glands, which are not known to have other than a nerve supply derived from the sympathetic; he quotes facts observed by Brown-Séquard, Meyer, and Gairdner, to show the influence of the sympathetic system on the sudoral secretion—that is to say, paralysis of the sympathetic produces an augmentation of the cutaneous transpiration. We know that jaborandi increases this secretion, and we know that we can prevent that by administering previously or at the same time a small dose of sulphate of atropine; we are also aware that the influence of these drugs on the *capillary circulation* does not account for the effect, because congestion of the skin occurs frequently without perspiration, and cases have been observed (the third stage of ague being a constantly-recurring example) in which the congestion precedes the perspiration, but disappears when these glands are in full exercise

THE MONTHLY ABSTRACT
OF
MEDICAL SCIENCE.

VOL. III. No. 1. (For List of Contents see last page.) JANUARY, 1876.

Anatomy and Physiology.

On the Condition of the Walls of the Vessels during the Emigration of White Blood-Corpuscles.

Dr. JUL. ARNOLD, of Heidelberg (Virchow's *Archiv*, vol. lxii.), has examined the conditions under which red blood-corpuscles emigrate, and the question arose whether the white blood-corpuscles leave the walls of the vessels in the same manner, or whether they penetrate the epithelial plates themselves. To decide this question, he examined the mesentery, the tongue, and the bladder of the *rana temporaria* and the *rana esculenta*, and found that generally the white corpuscles leave the vessels by means of stigmata. The irritation of the organs was caused in different ways. Thus, the mesentery was exposed for a few hours to the atmosphere, while the tongue was injured and the bladder was injected by a weak solution of nitrate of silver. Infusions of cinnabar into the blood were also made with the view to colour the white blood-corpuscles. Twenty-four hours after the operation the animals were bled to death, and then the circulatory system was injected from the aortic bulb by a solution of nitrate of silver from $\frac{1}{2000}$ to $\frac{1}{3000}$. The examination of the preparation took place immediately in a three-fourths per cent. solution of chloride of soda, or after colouring with carmine in glycerine.

The white corpuscles could be observed in numerous phases of emigration. The transmigration always took place at certain points (stigmata). Had the process of emigration been stopped in time, the emigrated blood-corpuscles were to be seen in the sheath of vessels, or at a short distance from this. The form of the white corpuscles is elongated in the state of escape. Many of them have prolongations, fixed in the stigmata. Sometimes numbers of white corpuscles accumulate on the outer wall of the vessels, so that the lining epithelial membrane appears to be separated from the sheath of the vessel. The author never observed that the plates themselves were penetrated by the white corpuscles.

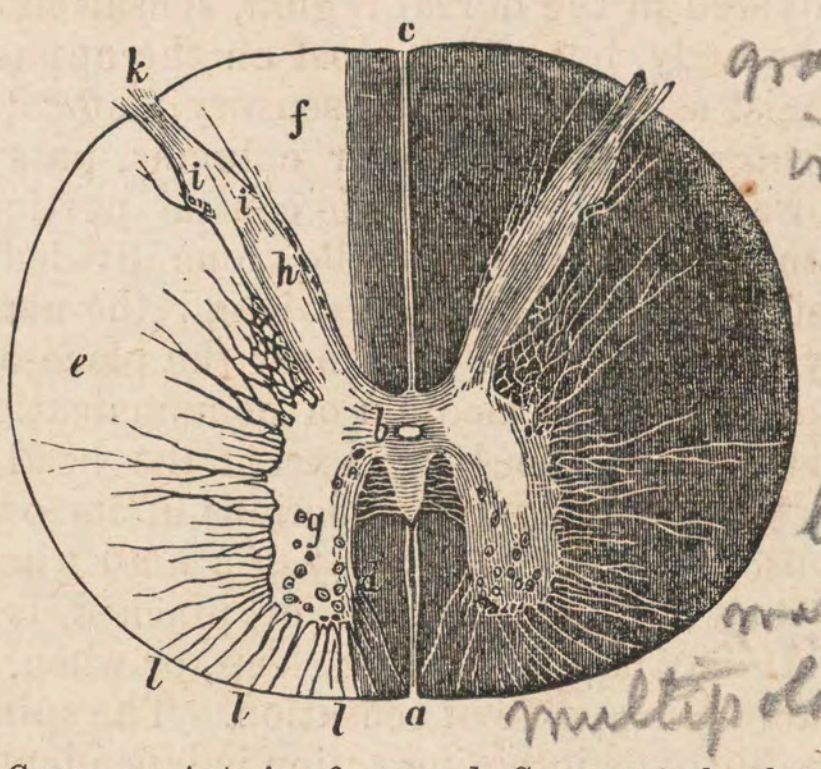
As a result of the disturbance in circulation, combined with the emigration of white blood-corpuscles, it was found that the borders of the cells forming the vessels are not so distinct as in a normal state. Between them are a greater number of dark spots (stigmata) than in a normal state, generally not so large that red blood-corpuscles could pass them. Dr. Arnold observed that granules of cinnabar, as well as colloid substances, may leave the vessels through the stigmata. The cause of the easier penetrability of the vessels may be found in an alteration of the condition of the cement connecting their cells.

A question exists, also, whether in each of these instances, the "sympathetic" ganglia control and regulate the organic functions, only by their influence over the action and calibre of the *blood-vessels*, or by a more *direct* power exerted over secretion and nutrition. Much has been made recently (especially in the *neuropathy* of Dr. John Chapman) of the vaso-motor action of the ganglia, and the modifications of it produced by temperature, &c. Pflüger's experiments, however, clearly demonstrate that the nerves exert an influence over the secretory action of glands *apart from*, or over and above, that belonging to changes in the circulation of the blood. These changes, also, are, no doubt, important.

SPINAL MARROW.

Consisting of a central ganglionic mass, inclosed in columns of white nerve-substance, the functions of the spinal cord are complex. After Sir Charles Bell had demonstrated that different nerves going to the same parts may have different functions, Magendie

Fig. 142.



SECTION OF SPINAL CORD.—*a*. Anterior fissure. *b*. Gray central substance. *c*. Posterior fissure. *e*, *f*. White substance. *k*. Posterior nerve-root. *l*, *l*, *l*. Anterior filaments.

extended this discovery to the roots of the spinal nerves. He proved that the *posterior* roots are entirely *sensory*, or afferent, and the *anterior* roots exclusively *motor*. This is shown by the fact that, when a posterior root alone is divided in a living animal, irritation of the end left in connection with the spinal cord will produce signs of pain; while irritation of the distal end will cause no result. On the contrary, if an anterior root be cut across, irritation of the end next the spinal marrow will produce no effect; but excitation of the end connected with the muscles will throw them

into action. Beyond their roots, the spinal nerves are mixed, containing both sensitive and motor filaments.

Part of the functional use of the spinal cord is, to transmit impressions, sensory and motor, to and from the brain. This is effected both by the white and the gray substance; ~~principally, it may be supposed, by the former~~. A difference in function between the anterior and posterior *columns* of the cord has been proved. The *anterior* columns, under excitation, emit motor impulses through their motor nerves, producing action of muscles. The *posterior* columns, when irritated, display sensibility instead.

Crossing or *decussation*, however, occurs in the cord. The *anterior* columns decussate at the medulla oblongata, just within the skull. Therefore, disease of the brain (apoplexy, compression from fracture, &c.) on one side, commonly produces paralysis of motion on the other side of the body; as, in many cases of what is called *aphasia*,[1] disease of the left side of the brain is attended by right hemiplegia, *i. e.*, palsy of the right half of the body.

Brown-Séquard has inferred from his experiments that the *sensory* filaments of the spinal cord cross each other through the *whole length* of the cord. If, for instance, one lateral half of the spinal marrow of a dog be divided in the dorsal region, sensation will remain on that side of the body, but will be lost on the opposite side. The same physiologist asserts, that ~~the~~ some sensory filaments of the spinal nerves, after entering the posterior columns, pass *through* them, and go up toward the brain in the central portion of the cord. Therefore, if the posterior columns be alone divided in any part of the cord, sensibility is not destroyed in all the nerves below that part, but only in those which enter near the place of division.

Besides thus acting as a medium of communication between the brain and all parts of the body except the head and face, the spinal marrow has more special functions of its own, as the seat of reflex actions. The drawing away of a limb when it is touched by anything very hot or very cold, or pinched, is often entirely involuntary. It may happen during sleep, or when, from paralytic disease, the part is incapable of sensation. The spinal cord seems, here, to be capable of maintaining action independently of the brain. This has, also, been abundantly proved in decapitated animals.

The habitual passive action of the muscles, though perhaps resulting in part from the essential nature of living muscle, is under the *influence* of the spinal marrow; as shown by an experiment of Wilson Philips. He found that, when a red-hot iron rod was suddenly thrust through the whole length of the spinal cord, all the muscles became relaxed at once.

The *sphincter* muscles, which guard the outlets of the rectum and bladder, are kept in due contraction under this influence of the

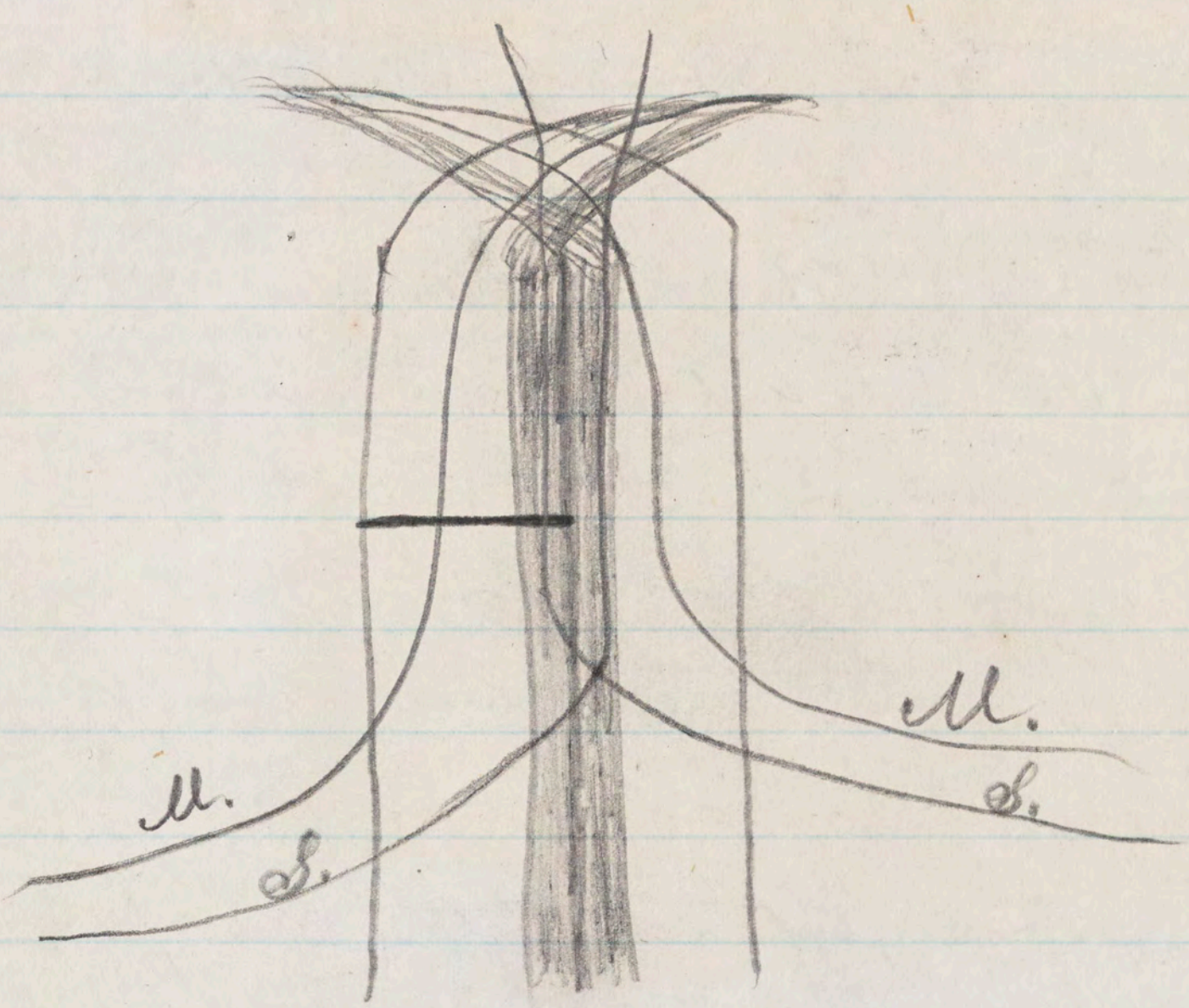
[1] Loss of language, from cerebral disorder.

HEMIPLEGIA WITH CLOT UPON THE SAME SIDE OF THE BRAIN.—At the recent meeting of the American Neurological Association, Dr. Hay, of Chicago, presented an interesting specimen of this kind, removed from a female patient æt. 55 years, in whom there was hemiplegia of the left side, face not involved, and the tongue could be protruded without deflection. The patient jumped from a railroad-train which was moving at a rapid rate, and was picked up insensible, in which condition she remained for about three weeks. She suffered from incontinence of urine and fæces. At post-mortem a meningeal clot was found over the frontal convolution, upon the left side of the brain, about a line in thickness, three-fourths of an inch in length, and about the same in width. No morbid conditions were found in any other part of the brain, and the clot was limited to this region.

Might not a spinal injury have occurred also, accounting for the paralysis?

the members may see the intestinal villi of the rabbit perfectly injected, and mounted in natural position, so that the mucous surface appears with the entire columnar epithelium attached, each cell distinct. Most of the villi show the muscles of Brücke clearly. In the muscular coat of the same intestine the lymphatic vessels appear without injection.

"A slide containing a piece of mesentery of juvenile cat shows one dozen Pacinian bodies, which must be seen under the binocular to be properly appreciated. These supposed nerve-terminations in dead cats vary greatly in size and apparent complexity of structure, being from the $\frac{1}{200}$th of an inch up to a magnitude which unaided vision can detect. The fat-tissue is well injected, and the crystallized fat appears *in situ*, not having been dissolved out as is usually the case. The nerves are preserved with less structural change than I have seen elsewhere. Their nucleated filaments appear


M.
M.
S.
S.

See Dalton

Dalton concludes that the gray matter is necessary to conduction of both sensory & motor impressions through the cord; for sensory " even without the poster. columns; for motor, only with the anterior columns. Dalton says: "The various nervous tracts, as well as the white and the gray substance, are associated in such a manner as to make of the cord a single organ, more or less complicated in structure, which cannot be separated, so far as our present knowledge extends, into completely independent parts." Physiol., 6th ed., 1875, p. 454.

found in both cases, point to the action of an poison acting primarily on the cerebro-spinal nervous system. The order of the severity in the various parts seemed to be—first and worst, the medulla; secondly, the cord; thirdly, the central convolutions; and fourthly, the central ganglia of the encephalon.

J. LOCKHART CLARKE, M.D.

THE OPHTHALMOSCOPE IN GENERAL PARALYSIS.

Dr. Aldridge (*West Riding Reports*, vol. ii. 1872)

The lateral grey substance of the right side in dogs, rabbits (and also in man), specially, and perhaps also exclusively, conducts the sensations of pain of the left hinder extremity, and *vice versâ*. An exception to this is in cats, in whose cords the sensory paths do not decussate. In these the grey substance conducts the sensations of pain on the same side. The decussation appears to be more complete in man than in the dog. Schiff has seen a

was only wakeful from an ordinary amount of mental work (where there is hyperæmia of the brain) the same dose produced sound and refreshing sleep. Given when the brain receives only an usual amount of blood, it produces unusually profound sleep. Voisin, referring to his patients in the Bicêtre, says, 'The hypnotic action was very remarkable upon them, both night and day. Some were obliged to minutes at a time in the midst of their

V. PATHS OF CONDUCTION IN THE SPINAL CORD.—M. Schiff had already found that the posterior columns conduct only the impressions of touch (Tastempfindungen), but not those of pain or pressure; a fact which agrees with the pathological conditions of loss of tactile sensation and retention of the sensibility to pain. Hence, when the cord is severed, so that only the posterior columns remai
the sense of touch alone remains. S

is not a cause of trophic disorders, the same rule must plainly hold good as regards the paralysis produced under the influence of the dilator nerves. But, gentlemen, as you will see further on, the mode of action of the dilator nerves may be considered from an altogether different point of view.

I would remind you of the fundamental experiments of Ludwig, relative to the influence of certain nerves on the secretion of the submaxillary gland.[1] Notwithstanding the criticisms which have assailed the conclusions drawn from his experiments by this celebrated physiologist, these conclusions do not appear to have been shaken. I have to request your permission to enter into some details in reference to this subject; they are absolutely necessary for the object we have in view.

When you irritate the peripheral end of the nerve proceeding to the submaxillary gland—a nerve supplied as we now know from the chorda tympani—the following phenomena are observed. A very abundant secretion of saliva is produced, the quantity may be so large that, in a short space of time, the volume of saliva secreted shall greatly exceed the volume of the gland itself. This fact demonstrates at the outset that we have not to deal here with a simple phenomenon of excretion, or expulsion of previously secreted saliva.

According to the views of Stilling and of Henle, which prevailed at the time Ludwig published his first investigations, one might be tempted to explain the phenomena in question by admitting that the irritated glandular nerve acts upon the veins of the gland, causing them to contract. The augmentation of the tension of the blood, consequent on the venous contraction, would, by this hypothesis, be the cause of the augmentation of the salivary secretion. But Ludwig has shown that ligature of the veins, without concomitant irritation of the glandular nerve, does not increase the

no wheals perceptible. It is highly interesting to note that when this urtication made its appearance in the loins, the formication disappeared from the upper extremities.

As there was reason to suspect the existence of ocular troubles, we interrogated his memory, and found that he had observed something like a mist before his eyes, especially at night. This disorder had, in fact, reached such a point in January, 1874, that he had given up attempting to read. On the left eyeball, a harmless pterygium was remarked. Applying the ophthalmoscope, Professor Panas found that the fundus of the right eye was normal, whilst there was a very marked excavation of the papilla of the left eye, the fundus of which was slightly congested.

Let us note, in conclusion, that during the continuance of his ailment he complained of great thirst, and of unusual drowsiness after meals."

This patient recovered under treatment by faradization, as related in the treatise already mentioned (S.).

[1] Ludwig, 'Mitth. der Zurich Naturforsch.,' 1851. 'Zeitschr. für rat. Med.,' n. f. Bd. i, p. 255. 'Wiener Med. Wochenschr.,' 1860, x, No. 28, p. 483. See also the works published by Ludwig in co-operation with Becher, Rahn, and Gianuzzi.

secretion of saliva. That second hypothesis should, therefore, also be eliminated.

But perhaps the irritation of the glandular nerve which, as you are aware, has the effect of inducing dilatation of the arteries, may determine the secretion, simply because it momentarily augments the afflux of arterial blood into the gland? This argument is rendered invalid by an experiment made by Ludwig, which shows that, during irritation, the manometric pressure in Wharton's duct is superior to the pressure of the blood in the arterial conduits. Besides, the hypersecretion of saliva from irritation of the chorda tympani is still exhibited, after ligature of the arteries supplying the gland—in the case of an animal killed by bleeding—or even in the case of a head separated from the body. Let us also add this most remarkable fact, namely, the saliva and the venous blood which flow forth from the submaxillary gland, whilst the glandular nerve is being stimulated, present, as MM. Ludwig and Spiess[1] have shown, a higher temperature than the arterial blood which passes into the gland.[2]

Judging from the general bearing of these results, it appears evident that the influence of the nervous system on the submaxillary secretion cannot be explained by the simple phenomena of vascular dilatation and constriction. We are induced to recognize in the glandular nerve a two-fold property, since, in addition to its influence over the vessels, the dilatation of which it determines, it also exerts an immediate action on those parts of the gland which accomplish the chemical act of secretion, or, in other words, upon the secreting cells. This influence of the nerve upon secretion seems, indeed, to be the fundamental fact, for it shows itself, in consequence of excitation, even when the effects of the concomitant dilatation are annihilated. As, on the other hand, it does not appear possible, experimentally, to suppress separately the secretor action, leaving the dilator action alone persisting,[3] it is legitimate to suppose that the latter depends on the former as a more or less direct consequence.

We had, therefore, reason to inquire what might be the link of connection between the excitation of the secretor elements determined by stimulation of the nerve, and the hyperæmia which

[1] Ludwig und Spiess, 'Sitzungsber.,' d. v., Ak. Math. Cl., 1857, Bd. xxv, p. 584.

[2] In reference to this, see a Lecture of M. Vulpian, 'Revue des Cours Scientifiques,' 3d année, 1865-1866, p. 741.

[3] By recent experiments, however, M. Heidenhain seems to have been able to demonstrate that, in the chorda tympani, different nerve-fibrils are devoted to secretion and to circulation in the submaxillary gland. He states that in dogs, placed under the influence of woorari, after injection into the jugular vein of a dose of atropine sufficient to completely paralyze the cardiac filaments of the pneumogastric, the stimulation of the chorda tympani no longer determined the slightest secretion. Nevertheless, there was an acceleration of the venous current which did not notably differ from the acceleration determined by irritation of the chorda, before poisoning. 'Archives de Physiologie,' 4 Juillet, 1872.

follows that excitation. Several physiologists have thought that we have here to deal with an *attraction* which the secretor elements of the gland should exert upon the blood. "So that to the force hitherto known as assisting the return of the circulating blood to the heart and which is termed *vis a tergo*, we should add a new attractive force in correlation with the intimate nutrition of the elements, a force named by many authors *vis a fronte*."[1] Is this a purely theoretical conception, unsupported by experiments, and merely destined to cloak our ignorance? By no means. The works of H. Weber, Schuler, Lister, etc.,[2] contain numerous experimental facts calculated to render evident the *attraction* which the tissues can exercise, under certain conditions, over the circulating blood. I will cite two facts of this sort as examples, in which the phenomena may be studied apart from any intervention of the nervous system. I borrow them from a lecture on the Theory of Secretions, delivered in the Museum of Natural History, by Professor Vulpian.[3]

If you cut all the nerves of a frog's limb and then determine an excitation by placing a small drop of nitric acid on the skin of the web of its foot, a more or less intense hyperæmia will be produced in this point, at the end of a certain period. The second fact is conclusive. An egg on the fourth day of incubation presents a very distinct vascularity of the umbilical membrane. At that period, there cannot be the slightest question of nervous influence. Now, if you place a small drop of nicotine on any point of this vascular area, there ensues around this point so great a congestion that almost all the blood flows thither. In truth, this hyperæmia, this stasis by irritation of the tissues, displays itself, at first glance, with I know not what semblance of a metaphysical conception. But an effort has long since been made to give an interpretation of this phenomenon on physico-chemical grounds. Thus, in 1844, Dr. Draper[4] remarked that where a capillary tube contains two liquids, of different natures, if one of them have a greater chemical affinity for the parietes of the tube than the other, motion ensues, and the liquid which has the greater affinity pushes the other before it. The arterial blood having a greater affinity for the tissues than the venous blood, saturated with the products of disintegration, it should follow that the venous blood would be driven back. According to this hypothesis, it would suffice to quicken the chemical process of nutrition, in order to increase the intensity of motion (or afflux), and herein the action of the nerves may intervene. The phenomena of stasis are capable of being

[1] Vulpian, 'Revue des Cours Scientifiques,' t. iii, p. 744.
[2] See O. Weber, 'Handbuch der Chirurgerie,' t. i, p. 111.
[3] Vulpian, *loc. cit.*, p. 743.
[4] Draper, "A Treatise on the Forces which Produce," &c., New York, 1844. Savory, 'British and Foreign Review,' t. xvi, 1855, p. 19.

explained in an analogous manner, by an appeal to the laws of osmosis (blood-stasis, by diffusion).[1]

However it be, whatever may be the explanation of the phenomena, you perceive that the attraction which the tissues, under the influence of certain agents, exercise upon the blood is a fact experimentally established, wholly apart from any action of the nervous system. Now, in order to apply this datum to the case of the submaxillary gland, it suffices to admit that the glandular nerve, when subjected to excitation, induces a modification of the intimate nutrition of the secretor cells—and then, in consequence of this change, vascular dilatation would take place.

Anatomy seems, besides, to throw a new light upon the question by showing that the terminations of the glandular nerves penetrate into the secretor cells.[2] Herr Heidenhain has even endeavoured to demonstrate that a gland, of which the nerves have been subjected to a somewhat prolonged irritation, presents a histological constitution differing in some respects from that of a gland in a state of repose. The old cells, termed mucous cells, appear in fact, after the irritation, to be replaced by young cells of recent formation.[3] If the views of Herr Heidenhain be confirmed, we should attribute to the nerve a direct influence, so to speak, upon the development of gland-cells.[4]

The hypothesis which has just been formulated in relation to secretor nerves, might apparently be extended to other nerves in which experimental physiology has discerned the property of determining the dilatation of vessels under the influence of stimuli. These nerves would act primarily on the inter-vascular elements and quicken therein the movements of composition and decomposition. Vascular dilatation would follow, as a consecutive phenomenon. In support of this view, one may here also invoke the teachings of anatomy which, in these latter days, has, it is stated, succeeded in following, at least in the frog, the nerve-endings even into the nucleoli of the corpuscles of the cornea, and of the conjunctival cells of the nictitating membrane.[5]

[1] O. Weber, *loc. cit.*

[2] E. F. W. Plüger, "Das Nervengewebe der Speicheldrüse," in Stricker's Handbuch, t. i, p. 313.

[3] Heidenhain, "Studien der Physiologischen Instituts," 3e Breslau, 1868, and Stricker's Handbuch, *loc. cit.*, p. 330.

[4] According to M. Ranvier ('Traduction de Frey,' p. 437), and M. Ewald ('Jahresber.,' t. i, 1870–1871, p. 55), the results obtained by Herr Heidenhain ought to be interpreted as follows: Under the influence of the irritation of the gland-nerves, the cells called mucous cells simply lose the mucus they contain and resume the appearence of parietal gland-cells. There would consequently be no formation of new cells here, as Heidenhain asserts.

[5] See Kühne, in 'Gaz. Hebdom.,' t. ix, No. 15, 1862. Lipmann, "Endigung der Nerven im eigentlichen Gewebe und im hinteren Epithel der Hornhaut des Frosches," in Virchow's 'Archiv,' 38e Bd., p. 118, 1869. Eberth, in 'Archiv für Mikros. Anat.,' Bd. iii.

Brown-Séquard asserts, that it is shown by his vivisections:

1. Of the fibres sent to the sp. cord by the posterior roots, some go transversely, others upward, & others downward, at least as far as the central gray matter of the cord.

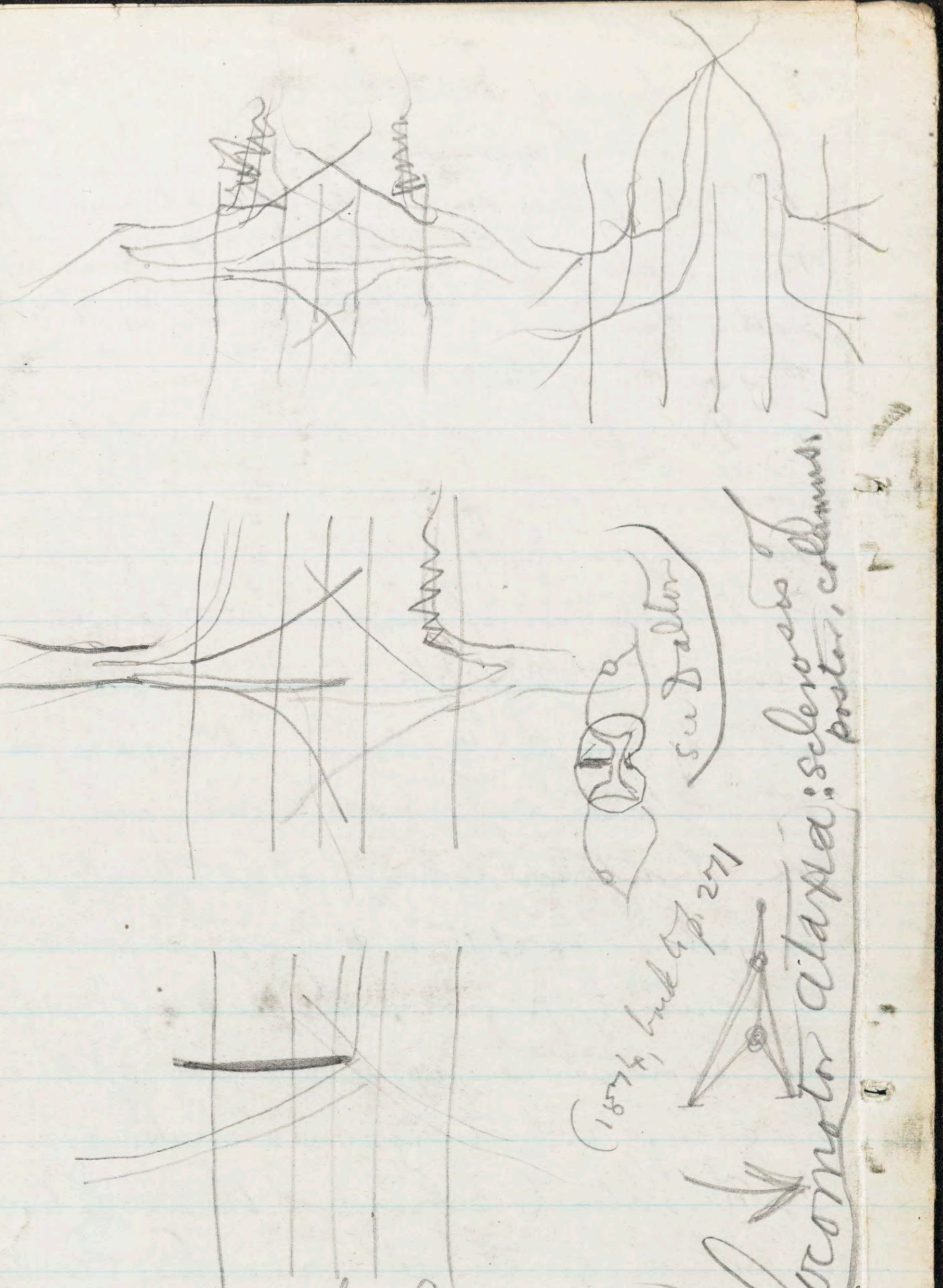
2. Decussation of the conductors of sensitive impressions takes place in the sp. cord, very near to the place of entrance of the filaments.

3. Decussation of the conductors for voluntary movements takes place chiefly, but not entirely, in the medulla oblongata, where the anterior pyramids cross each other.

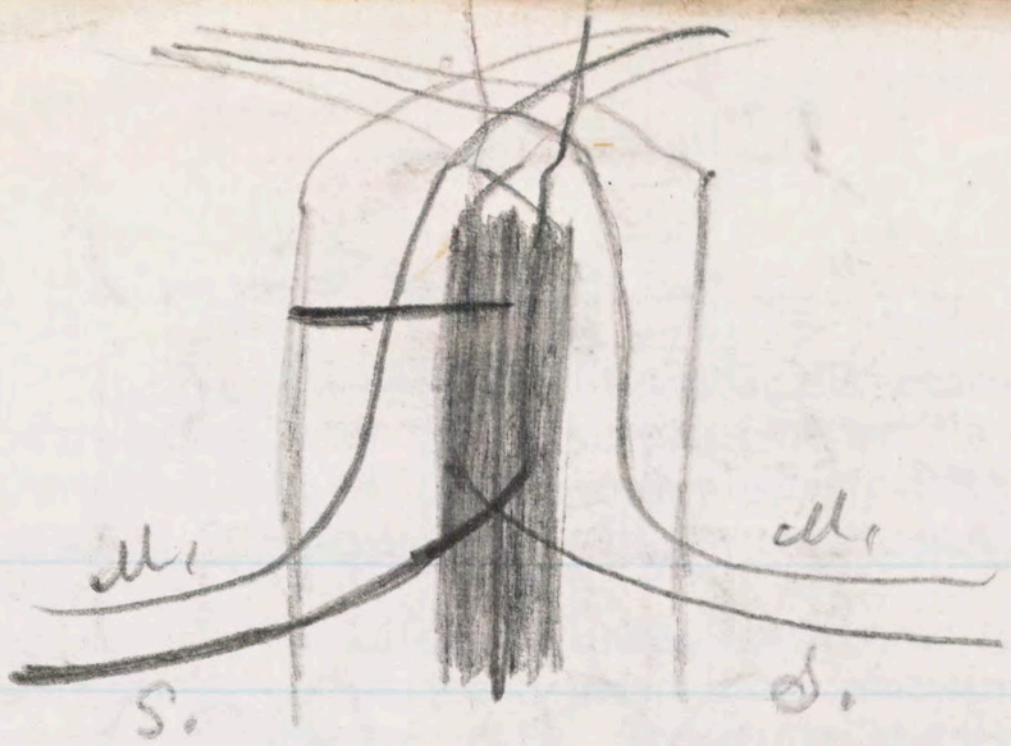
4. The anterior columns of the spinal cord, everywhere except in the upper part of the cervical region, have a great share in the conveyance of the orders of the will producing voluntary movements.

5. The lateral columns of the cord have a notably greater share in the conveyance of orders of the will to muscles in the upper parts of the cervical than in the dorsal and lumbar regions. + → over

Schiff asserts proof that post. columns median longit. bundles of filaments conduct common sensation at least in lumbar region tho' not necessary for conduction of pain.



Todd & others have supposed
poster. columns of sp. cord to be only
longitudinal commissures, for
coordination of muscular actions
under Spinal reflex action: as in locomotion.



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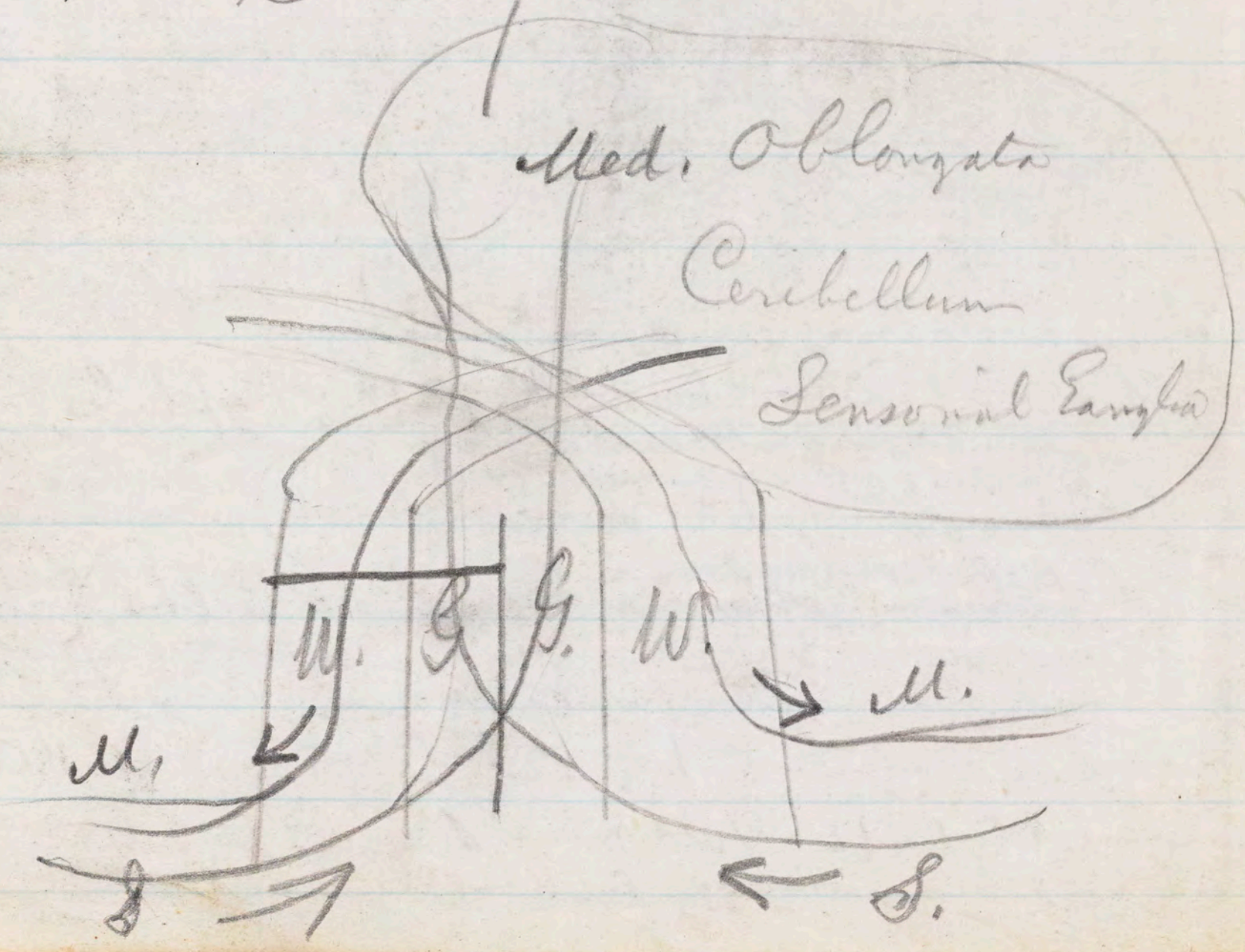
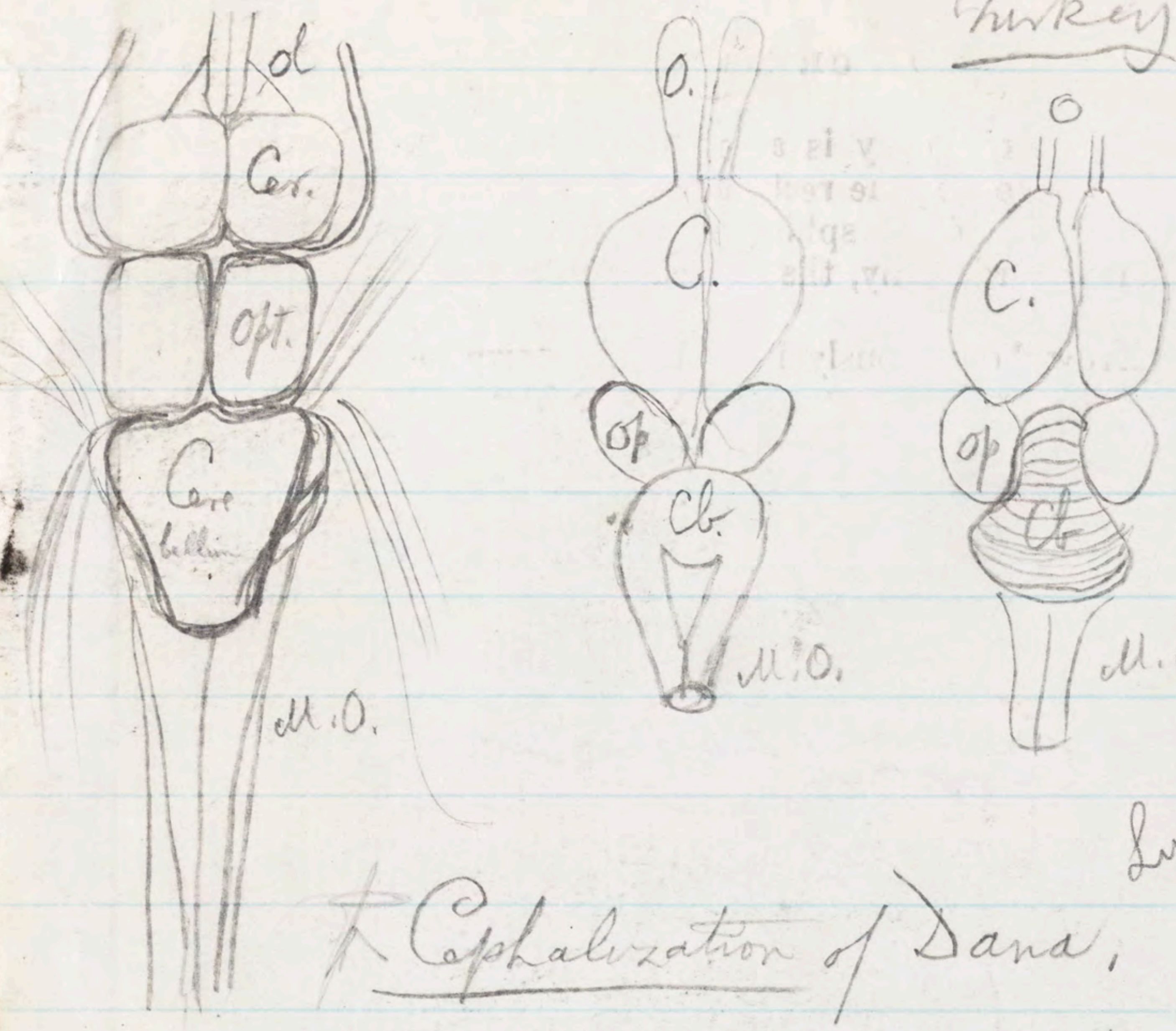
Encephalon



Pike. Lizard Turkey



Owen

Lyencephala
Lissencephala
Gyrencephala
Archencephala

Cephalization of Dana.

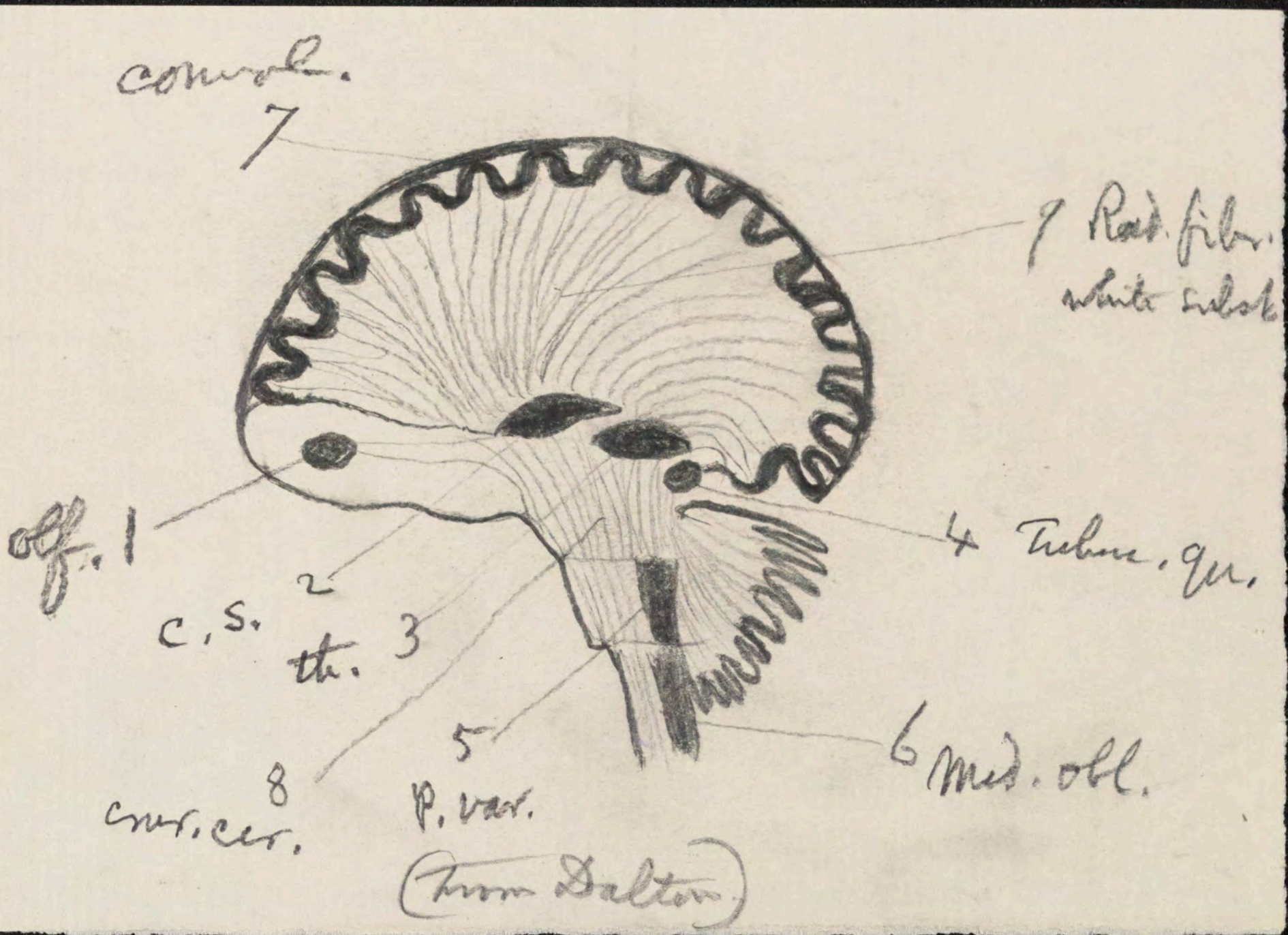
Brain of child of 4 yrs twice as large as that of adult Gorilla, weight probably 4 times as much (Huxley).

owls & elephants w/ frontal sinuses

Encephalon to body in ^mammals, 1 to 186; birds, 1 to 212; Reptiles, 1 to 1321; Fishes, 1 to 5668. (Leuret).

(Actual weight of brain in Elephant 8 to 10 lbs
" " Whale 5 ")

Proportion in marmoset, 1 to 22; linnet & canary, 1 in 15 to 20 blue headed tit, 1 in 12; field mouse 1 in 31;
Anthropoid apes, 1 in 50. Crocodile's, thumb size.


conch.
7
9 Rad. fib.
white substk
Aff. 1
4 Tubes. Qu.
2
C. S.
th. 3
5
6 Med. obl.
8
Cur. cer.
P. Var.
(From Dalton)

spinal marrow. Its reflex agency is also, no doubt, concerned, differently, in the evacuation of the rectum and bladder; in order for which, the contraction of the sphincters yields to dilatation under expulsive effort. Ordinarily, the will can control and regulate these actions.

If the spinal marrow be seriously injured low down, loss of power over the sphincters results; and involuntary defecation, retention, and incontinence of urine follow. If high up, disturbance of the secreting organs occurs, from the influence of the spinal cord over the ganglia. Injury of the spine in the neck, as high as the third vertebra, is almost always fatal at once, by interruption of respiration; to which a sound state of the phrenic and intercostal nerves is essential.

ENCEPHALON OR BRAIN.

All the contents of the cranium, together, constitute the *encephalon;* the average weight of which to the whole body, in man,

Fig. 143.

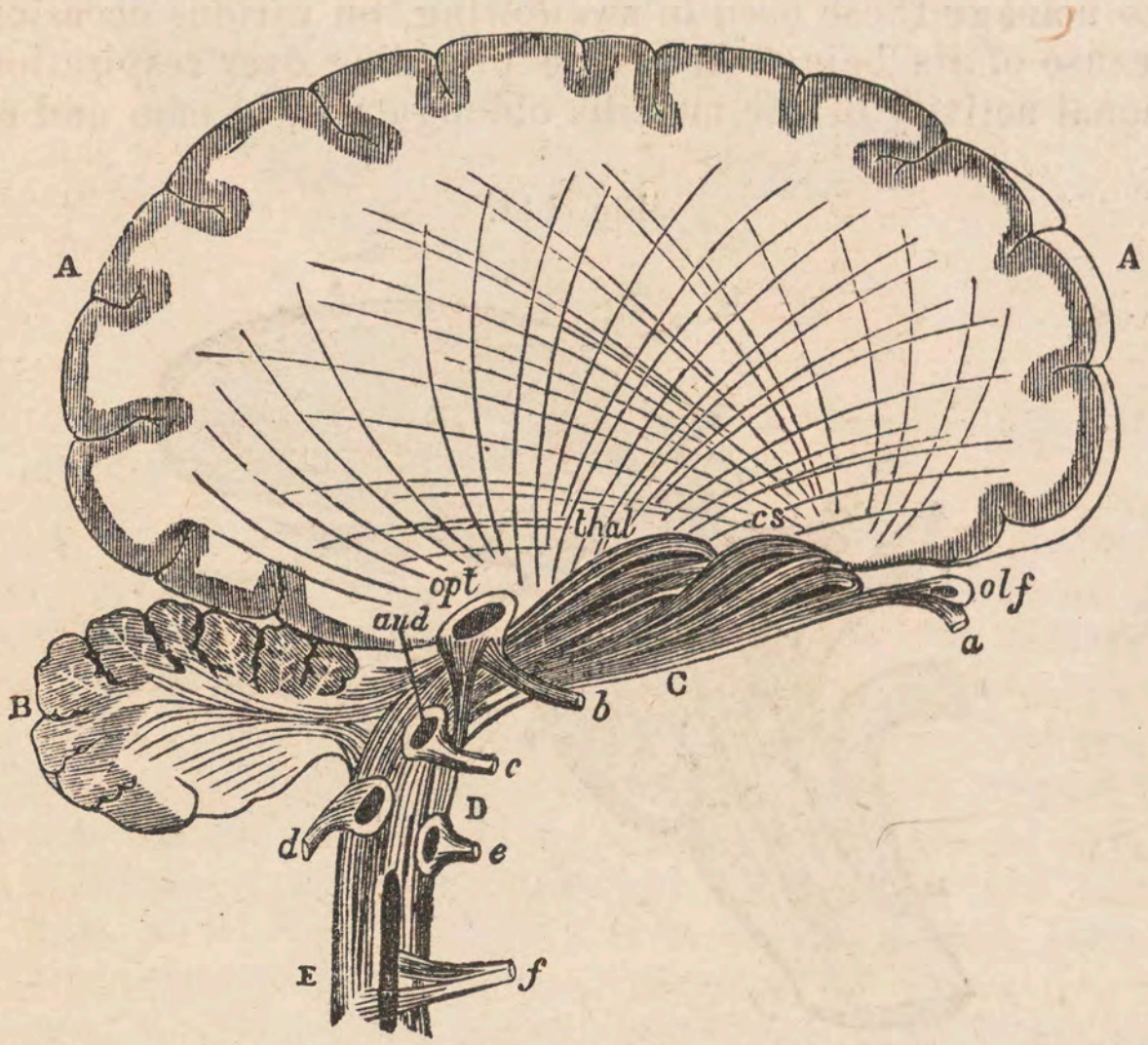


Diagram of Encephalon.—*A.* Cerebrum. *B.* Cerebellum. *C.* Sensori-motor tract. *D.* Medulla oblongata. *E.* Spinal cord. *a.* Olfactory nerve. *b.* Optic. *c.* Auditory. *d.* Pneumogastric. *e.* Hypoglossal. *f.* Spinal.

bears the proportion of 1 to 36. In mammals (animals which suckle their young) as a class, the average proportion of brain to body is 1 to 186.

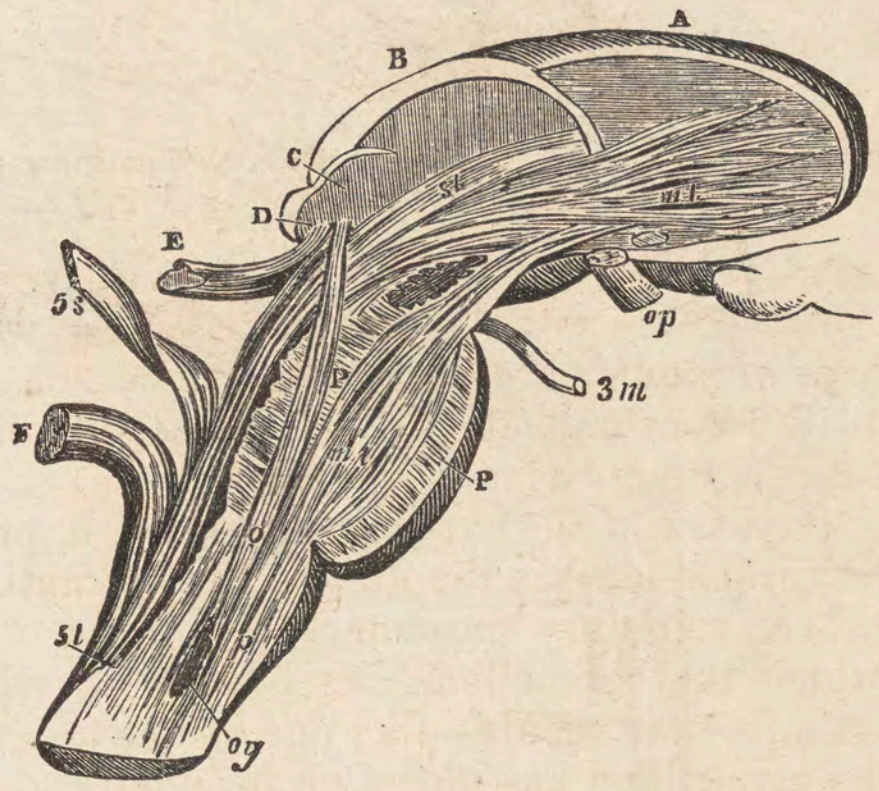
The *parts* of the encephalon are, the *medulla oblongata* and *pons Varolii*, the *cerebellum*, and the *cerebrum*. Further subdivision of these, of course, may be made, upon both anatomical and physiological grounds. If the whole encephalon were divided into 204 equal parts, the cerebral hemispheres would make of these 170 parts, the cerebellum 21, the medulla oblongata, corpora striata, and thalami 13 parts. On the same scale, the spinal cord would weigh 7 parts. The comparative size of these different portions of the nervous system is very different in different animals.

Medulla Oblongata.

Although several nerves of different functions begin or terminate about the place of union of the medulla oblongata with the base of the brain, the peculiar attributes of this centre are connected with respiration and deglutition. It is the seat of the reflex actions essential to those functions; the performance of which is, in its nature, spinal, while, for obvious reasons of convenience, they are both voluntary to a certain degree. For speech, we must have some control over the expiratory muscles; and so we must be able to manage those used in swallowing, on various occasions.

Because of its being the centre presiding over respiration, the functional activity of the medulla oblongata is, in man and all the

Fig. 144.



MEDULLA OBLONGATA.—*A.* Corpus striatum. *B.* Thalamus. *C, D.* Corpora quadrigemina. *E.* Commissure. *F.* Corpora restiformia. *P, P.* Pons Varolii.

higher animals, indispensable to life. Mechanical injury or disease affecting it considerably, or narcotism of it by large quantities of chloroform, &c., is fatal.

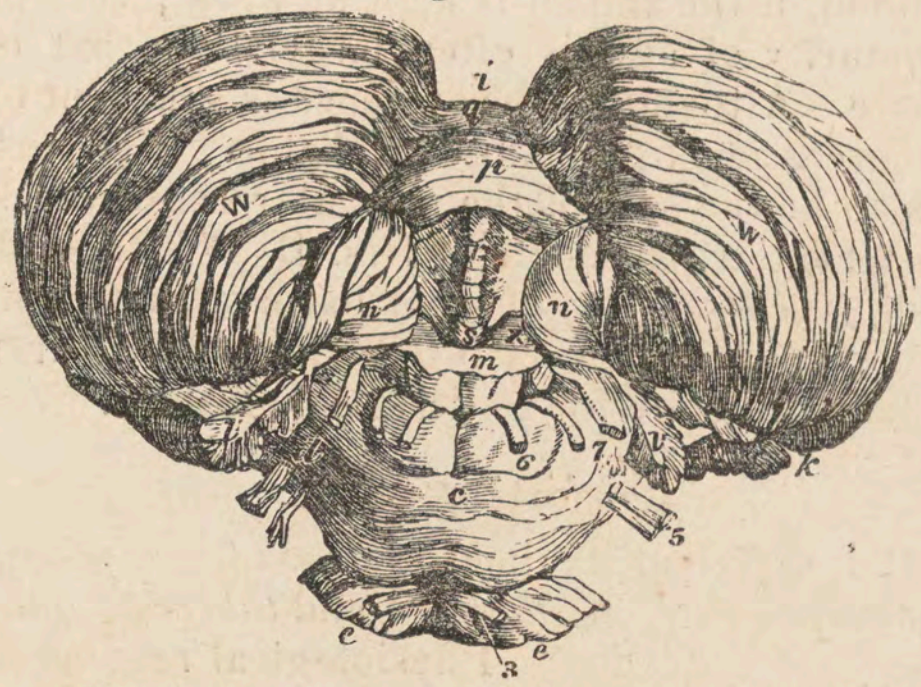
The *pons Varolii* or tuber annulare is, in its greater part, com-

missural ; *i. e.*, connective, between the two halves of the cerebellum, and, by a small number of its filaments, passing also into the two hemispheres of the cerebrum. A mass of gray vesicular nervous matter, however, is imbedded within it; which Longet and others believe to be "the ganglion by which impressions, conveyed inward through the nerves, are first converted into conscious sensations; and in which the voluntary impulses originate, which stimulate the muscles to contraction."[1]

Cerebellum.

Gall, the founder of the system of phrenology, proposed the opinion, founded upon a few coincidences, that the cerebellum is

Fig. 145.



CEREBELLUM.—*m*. Medulla oblongata. *c*. Pons Varolii. *w*. Hemispheres of cerebellum. *i*. Middle notch. *p*. Pyramids. *e, e*. Crura. 3 to 7. Nerves.

the seat of "amativeness," or the sexual propensity. Investigation has not sustained this view. Upon any such question, three principal methods of inquiry are open: 1, comparison of structure and function in different animals; 2, the results of disease or injury; 3, experiments upon living animals. Flourens, Longet, and others have, on the basis of the experimental method, proposed the theory, that the cerebellum has the duty of co-ordinating, or harmonizing together, voluntary muscular movements. A bird or animal from which the cerebellum has been removed, loses the power to regulate its movements—like one intoxicated.

Disease of the cerebellum has not often been, after death, shown to have been connected with special symptoms; but some instances have occurred, which at least do not oppose the above theory.

Comparison of the structure of the brain, and the corresponding endowments of different animals, is, upon this as on other allied topics, the most instructive method. No relation appears between

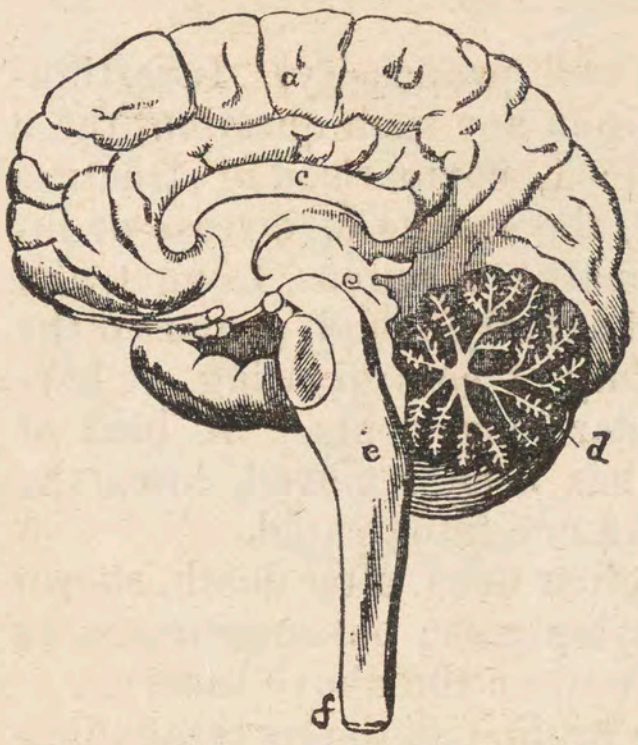
[1] Dalton's Physiology, p. 423.

the size of the cerebellum and the sexual appetite. It is large, comparatively, in some animals (fishes) which do not copulate; and proportionately small in some, as the frog, in which the propensity is powerful. With locomotor activity, and especially *complexity* of movements, there does appear to be proportionate development of the cerebellum. So, in birds of rapid and varied flight, as the swallow and many birds of prey, it is large, while in the polygamous but heavily flying pheasant family, of which the common barn fowl is a member, it is small. The climbing ape has it quite large. The bear, which stands naturally on two feet, using the other two as hands, has a larger cerebellum than the dog, to which that position is unnatural. Lastly, removal of the testicles early in life does not, in the horse, at all lessen the growth of the cerebellum, if the animal is kept at work; that of the gelding, at full maturity of age, is often larger than that of the stallion or the mare. Altogether, the evidence is sufficient to make the theory of Flourens much the most probable. Perhaps the cerebellum may also be the seat of the muscular sense of Sir Charles Bell. Some recent experiments of Drs. B. W. Richardson and S. Weir Mitchell, in *congealing* different parts of the brain in animals by jets of ether spray, are very interesting, but their results are not yet sufficiently definite for positive conclusions.

Sensorial Ganglia.

Anatomically, sufficient distinction exists for naming, under this category, the *corpora striata*, *thalami*, and *tubercula quadrigemina*. Physiological reasons suggest the propriety of recognizing the association with these, of those other small ganglionic masses in which terminate the nerves of hearing, smell, and taste.

Fig. 146.



LONGITUDINAL SECTION OF THE BRAIN.—*a*. Right hemisphere of cerebrum. *c*. Corpus callosum. *d*. Cerebellum, showing *arbor vitæ*. *e*. Medulla oblongata. *f*. Spinal cord.

Experiments point to the *corpora striata* as the probable source from which emanate the *motor impulses* of muscular actions. Like evidence exists for the view that the thalami (formerly called *nervorum opticorum*) are the receptacles of impressions of *common sensation* or touch. Each *corpus striatum* is *anterior* to the corresponding *thalamus;* being thus continuous, the former with the anterior columns, and the latter with the posterior columns, of the spinal marrow.

BRAINS.—Dr. Hammond, President of the Neurological Society, said in a recent address: "The average weight of the brain of the white inhabitants of Europe is forty-nine and one-half ounces, the maximum being that of the brain of Cuvier, which weighed sixty-four and one-third ounces, and the minimum, consistent with a fair degree of intelligence, thirty-four ounces. The average of twenty-four American brains, accurately weighed by Dr. Ira Russell, was fifty-two and six-hundredths ounces, while that from 147 full negro brains was only forty-six and ninety-six hundredths ounces. Turning from the weight of the brain to the capacity of the cranium, we find that this capacity in the Teutonic family, including English, Germans and Americans, is ninety-two cubic inches. The largest recorded capacity of the cranium is that of Webster, one hundred and twenty-two square inches. Owing to disease, however, Webster's brain weighed but sixty-three and three-quarter ounces, thus placing him second only to Cuvier. In the native African negro this capacity is reduced to eighty-three cubic inches, and in the Australian and Hottentot to seventy-five. The brain of an idiot seldom exceeds twenty-three ounces in weight, while in one instance coming under the speaker's own observation the mature brain weighed but fourteen and one-half ounces."

all possible haste, but neither he nor the physicians subsequently called could hold out any hopes of the child's recovery. The victim proved to be Mabel H. Young, who, in company with an aunt, had that afternoon attended a Sunday School anniversary at the church. On coming out of church at 3.30 o'clock the aunt remained in the vestibule about ten minutes, conversing with some friends, and on starting home missed the child, who a few minutes before was at her side. At first it was supposed she had gone back into the church, but when she was not found inside, and persons outside declared she had not come out, the aunt became alarmed, and search was commenced in every direction. Thomas Piper, who has been sexton of the church for about a year, was subsequently arrested on suspicion. He was about the church at the time the crime was committed, and his guilty manner, and other circumstances, lead to the supposition that he may have committed the deed. No motive, whatever, for the commission of the crime, has been suggested.

CONVENTIONAL PHRASES.—"What a struggle to express thought we detect in any one who, having abandoned himself to the formulas in vogue, tries to choose words for himself, and to say really what he thinks and means! The school-boy who indolently takes refuge in slang—or what is much worse than slang, the current phrase of the

THE REMAINS OF VOLTA, the Italian physicist, were disinterred on March 30th, at Camnago-Volta (Como), and, after being publicly exposed, were the next day placed in a marble sarcophagus in a mausoleum erected in his honor by his family. The opportunity was taken of obtaining measurements of the skull; the internal capacity of which, as ascertained by means of fine sand, was 1,865 cubic centimetres. According to the calculations of Professor Limbroso, this was larger than the skulls of Cuvier (1,829 cubic centimetres), and of Byron (1,807), and a little smaller than that of Cromwell. It much exceeds the ordinary Italian skull, which is about 1,500 centimetres in capacity.

portions connected by a fibrous mass. The patient could use his arm perfectly well. I presented this case in February, 1875, in Dr. Hamilton's clinic, and at a meeting of German physicians at Dr. Jacobi's residence.

Concerning the question of partial or total resection of the tibio-tarsal joint, a great difference of opinion is entertained among the surgical authorities. Hueter says as follows against partial resection: "Although I do not consider partial resection, especially the retention of the astragalus, a faulty operation, still I must express myself decidedly against the partial resection of this joint. The retaining of a malleolus must necessarily interfere with the

THE HEAVIEST BRAIN ON RECORD.— In our last number we gave some statistics with regard to the weight of the human brain. Since writing the article we have seen the report of a case in England in which the brain weighed over *sixty-seven ounces.* Dr. James Morris, of London, who describes the case in the *Bristol Medical Journal,* says: "The weighing was most carefully made, and was witnessed by several students. The brain was well proportioned; the convolutions were not flattened; though the surface was fairly moist, it only lost about one ounce weight after the usual dissection and draining for two hours. The specific gravity was not taken. The cerebellum and pons were separately weighed; of these I have not the figures, but there is no reason to suppose that they were disproportioned to the rest of the brain."

The proprietor of this big brain was a bricklayer, 38 years old, and of robust build. He was a native of Sussex, "not very sober, had a good memory, and was fond of politics." He could neither read nor write.

OXIDE OF ZINC IN NIGHT-SWEATS.— Dr. J.

iron, each 320 grs.; water of ammonia, water, each a sufficient quantity.

With four ounces of water rub the citrate of bismuth into a smooth paste; gradually add water of ammonia until solution takes place, being very careful not to have an excess of Ammonia. Now add the ammonio-citrate of iron and some more water: dissolve, filter, and wash the filter with enough water to make the solution measure one pint.

This solution, if intended to be long kept, may be partly made up with glycerine, although I can not speak from experience whether it is so well borne by the stomach. A more useful addition, however, is good sherry wine, of which there may be used ten fluid-ounces (or perhaps more), in place of so much water.

The above solution is prescribed under the name of Liquor Ferri et Bismuthi Citratis, and contains in one fluid-drachm two and a half grains each of citrate of bismuth and ammonio-citrate of iron. The dose is from one to two fluid-drachms, half an hour before meals, or — when required — after meals.

Average weight of human brain, male
(3 pounds)
48 to 50 oz, female 44 or 45 oz; maximum
~~common~~ statistical books)
63 ounces, — minimum, adult, 10 oz; idiot
boy 12 yrs old, 8½ oz. Flint knives, mentions brains
of some idiots, 54, 48, 46 & 44 oz. weights

Average Cranial capacity, European,
Martin gives
80 cub. inches; Negro, 70 c. in.; Bushman, 66;
Hindoos, 87 in.; ancient Peruvians, about same.
Largest cranium of 900 measured by R. Wagner
a woman's, — 1115 c. inches.

In proportion to body (Tiedemann) women's
brains generally are not lighter than men's.
Of 623 skulls measured by Morton, (from many nations
largest a German, 114 c. in. Smallest an Australian
58 c. in. Dan. Webster's, 122 cu. in. (yet Agassiz
found weight of his brain only 53.5 oz.! No doubt it
must have been morbidly atrophied) Dr. R. Richardson's
Anatomy mentions cranium of a German baker 63
Cabinet of Univ. of Louisville, 125.77 c. in.

Dupuytren's brain weighed less than 50 oz.
? Lord Byron's head was remarkably small — though
his brain after death was found to be quite heavy.
Cromwell's brain has been reported 82 oz.; but
Sömmering examined his skull and concluded
from its size that his brain could not have
very much above the average in weight. (Over

Encephalitis has been very heavy.

Semicirc. canals of ear also -

Ménières disease -

* Magendie reports case of a girl who, dying at 11 years of age, was found to have had no cerebellum. Only peculiarity, weakness in movement -

Celebrated Skulls.—At a meeting of the Academies des Sciences on November 17th, Barron Larrey presented a statement of the results furnished by the measurement by M. Lebon of the capacity of skulls preserved in the Museum of Natural History. Measurements taken of the capacity of forty-three skulls belonging to celebrated men, such as Descartes, La Fontaine, Boileau, Gall, and Volta, indicate, that the medium capacity being 14.30 cubic centimetres for the negro race, and 15.59 cubic centimetres for modern male Parisians, it is 16.82 cubic centimetres on the average for the skulls in question. The medium capacity of these skulls exceeds then those of ordinary Parisian skulls as much as the latter exceed that of negro skulls. Finally, the medium capacity of the twenty-six most remarkable subjects reaches the enormous figure of 17.32 cubic centimetres. It is quite exceptionally that great intelligence is found united to small capacity of skull.

An example how memory is not necessarily a high faculty of mind, is illustrated in one of the children in the Pennyslvania Training School for Feeble-minded Children, in Delaware county. So retentive is his memory that, after listening to a sermon or other discourse, he is able to repeat it verbatim, even to the intonations of the speaker. *Med. and Surg. Rep.*

of hay when it was offered to him; and I presume he is munching his hay to this day."

Prof. Meyer followed, and spoke generally of the advantages of the Graphic method.

Prof. Rood, of Columbia College, being called upon by the chair, paid a tribute to the modesty and patience of Dr. Meyer in the investigation of this subject.

Dr. Arnold in closing said that as the hour was late he would not continue the discussion; but he was glad to know that in this particu-

tal Necker. The patient, a man of forty-four, porter, had had a slight cough for sixteen years; on the 4th of March he was seized with a severe chill and headache, accompanied with pain in the side, and cough. On the 7th he felt a severe pain in the left arm, which prevented him from moving it; the inflammation at that point steadily increased, so that on the 13th he entered the hospital. On admission he was in a state of prostration, the lips were cyanosed as well as the fingers, and even the nails; he had difficulty in breathing, and cough with expectoration of a thin, whitish matter, sometimes reddish and tinged with blood; and physical examination revealed a pneumonia of the *right* side, at the same time there was noticed diffused phlegmonous inflammation of the back of the *left* shoulder. There was no pain in the joint, and the axillary glands were neither inflamed nor painful. On the 17th of March the abscess opened at the top of the shoulder, but the acromion was not affected, showing that the abscess did not have its starting point

FUNCTION OF THE THALAMI OPTICI (H. Nothnagel: *Centralblatt für Chirurgie*, No. 23, 1875).—After destruction of the thalami optici in rabbits, the animals stray about, still preserving the power of voluntary motion, neither paralysis nor anæsthesia being noticed, there being at most some loss of flesh after the expiration of some weeks. When, however, there was actually a total destruction of these organs, this result was abnormal, since the animal then allowed the fore-legs to remain in anomalous positions when thus placed. When the injury to the brain had been unilateral, this phenomenon was noticed only on the extremity of the opposite side of the body. Destruction of the thalami, as a rule, added nothing to the symptoms observed when some of the adjacent parts had been injured, but in some cases when the injury had been but partial in its character, in addition to a bending of the vertebral column and nystagmus, the head was held towards one side.

From these observations it is fair to conclude that neither the routes via which impulses to voluntary

(*Centralblatt für Med. Wissens.*, No. 25, 1875; from *Jahrb. f. Kinderk.*, T. viii., Klemm).—The laryngoscope can readily be used in the examination of the throats of children of three or four years of age, and local applications can also be made without disturbing the youthful patients. Among these remedies the use of solutions more dilute than when intended for adults, applied with smaller pencils, is advised in preference to that of powders applied by currents of air. With the exception of croup and diphtheria, diseases of the throat and larynx are of much more rare occurrence among children than among adults, and many affections which are common among them are unknown among the young. Among such may be mentioned chronic catarrh of the pharynx and larynx, and also syphilitic and tuberculous ulcerative processes, as of much less frequent occurrence in extreme youth than in adult life.

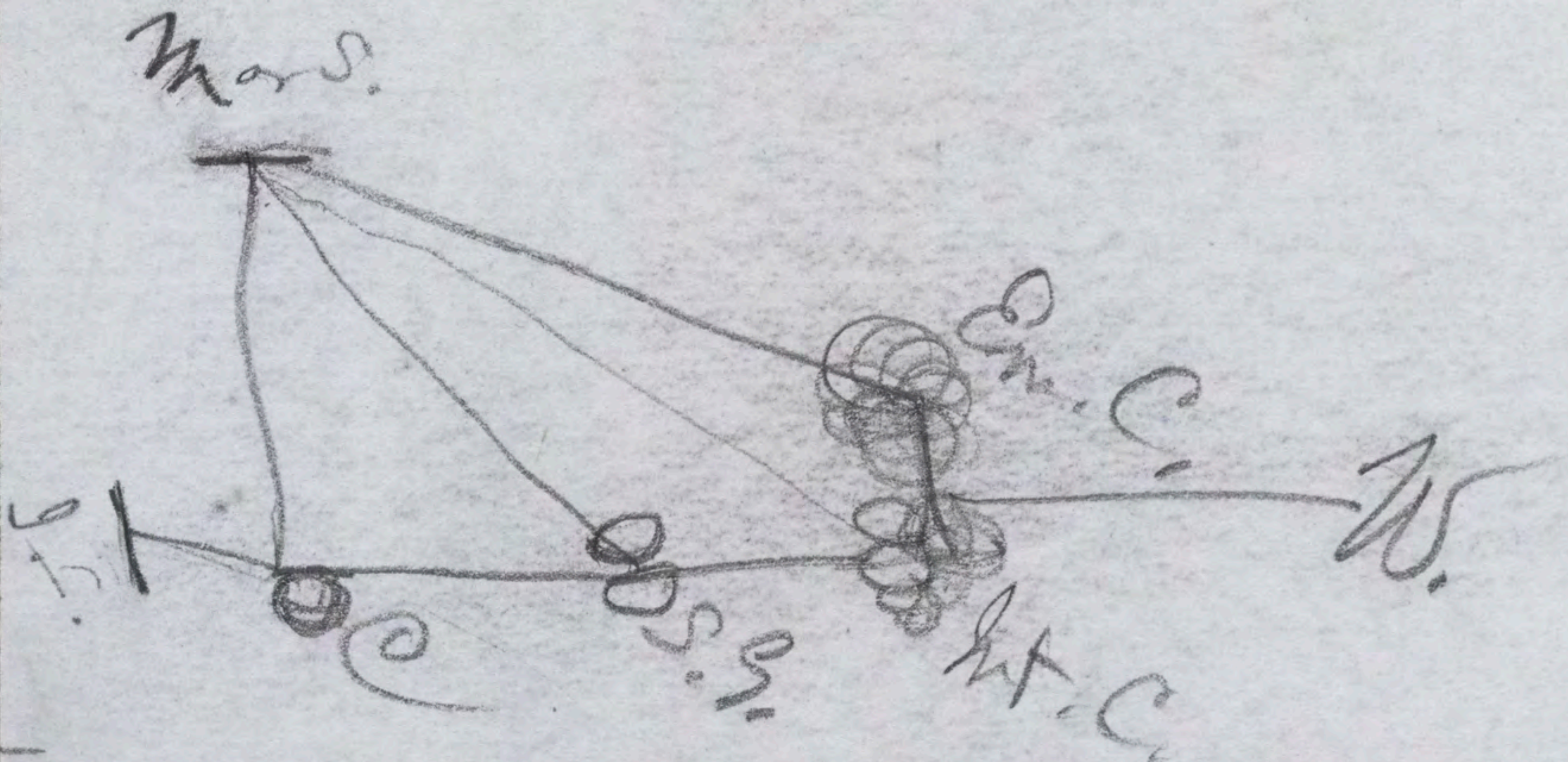
Klemm never saw primary laryngeal phthisis in a child, and concludes either that youth is in itself a protection against this affection, or that the exciting causes which play their part among adults are here wanting.

motion are transmitted, nor those which transmit sensation, pass through the thalami optici. The only positive disturbance which manifests itself after removal of these parts of the brain is a failure, under certain conditions, to retain the extremities in their proper position. Motor phenomena also occur in the thalami, which are excited by peripheral sensory impression.

Nothnagel then agrees with Maynert in regarding the thalami as the organs by which co-ordinated motions which are reflex in character and follow peripheral impressions are made possible. These in their turn pass from the thalami to the exterior of the front and sides of the cerebrum, become fixed in the ganglion-cells of these parts, are remembered, and serve in their turn as impulses to conscious action. W. A.

TRANSLATIONS.

PERIODIC MELANCHOLIA (Neftel: *Centralblatt für Chirurgie*, 1875, No. 22).—Dr. Neftel calls attention to a variety of melancholia which has not as yet been fully described, and which he thinks presents some characteristics the study of which may throw some light both upon the genesis and the treatment of the affection. A banker, aged 48 years, whose mother had melancholia sine delirio, has suffered since 1851 with attacks of melancholia of a periodical character which last from four to eleven months and are followed by periods of two to five months of comparative health. These attacks appear to occur entirely without cause, and are at first made manifest by irritability of temper, etc., which


Mar. S.
Em. C.
W.
Lat. C.

* Goltz's frog - see Hering

(Cerebral hemispheres removed)

will balance itself on ones hand (muscl sense!)

found

Cerebellum rarely removed after death

w/ insanity: corp. striata often

Nerves — motion of eye-muscles!

& nervous connections anatomically.

An Illustration! (1875-6.)

Human Brain, compared to the great Meetings of 1876.
Moody and Sankey, the

right & left hemispheres of the cerebrum;
Comprising most of the mind of the whole movement:
John Wanamaker, the cerebellum;
he being the brain reservoir of executive and administrative power:
John R. Whitney, treasurer, Medull, Oblongata;
without whose supply of forces everything must stop.
Thos. K. Cree, secretary, Corpora Striata;
through whom most of the motor impulses had to go out:
Geo. H. Stuart, the Thalami (both at once);
as a prominent centre of general sensation:
Newspaper men, the optic tubercles;
by taking a good look-out at everything going on:
Committee men, the other central organs of Spinal Sense;
Clergy and Choir, the Sympathetic ganglia;
The public generally of the Committee, the Cord;
Ushers and Police, the Spinal Cord and its nerves;
People on the platform, organs of animal life;
People on the floor, the rest of the organs of the body;
all made up of Zoads or plastids or bioplasts,
physiological or psychological units,
about 12000 in number altogether.!

(While using these celebrated evangelists and their meetings for an illustration, which seems to be amusing rather than scientific, far be it from me to show towards them the smallest disrespect. I doubt whether any other man now living has done so much real good amongst his fellow men as Moody has been, and is likely to be, instrumental in doing.)